Consult Phillips LP-Gas Engineers About an Emergency Stand-by Gas System!

Emergencies can occur in the best-managed utilities! Don't be embarrassed by gas shortages. Install a Phillips *66* Butane-Propane Emergency Stand-by System . . . now!

A Phillips *66* LP-Gas plant enables you to maintain required sendout when supplies of natural or manufactured gas have been curtailed or cut off completely. You can meet emergencies . . . on short notice . . . without restricting or cutting off either industrial or domestic consumers.

Ask to have a Phillips LP-Gas engineer show you how economical such a plant is to install and operate. For full information write our nearest district office.

Specialists in LP-Gas
For Stand-by Gas
Or Continuous Use

PHILLIPS PETROLEUM COMPANY

Philgas Division **SALES DEPARTMENT** **Bartlesville, Oklahoma**

Offices located in Amarillo, Tex., Atlanta, Ga., Chicago, Ill., Denver, Colo., Des Moines, Ia., Detroit, Mich., Indianapolis, Ind., Kansas City, Mo., Milwaukee, Wis., Minneapolis, Minn., New York, N. Y., Raleigh, N. C., St. Louis, Mo., Tulsa, Okla., Wichita, Kan.

A JENKINS PUBLICATION

EXECUTIVE
JAY JENKINS, President and Publisher
JAMES E. JENKINS, Secy.-Treas.
PAUL LADY, Advertising Manager

EDITORIAL
BILL CLARK, Managing Editor
GUY CORFIELD, Technical Editor
EDWARD TITUS, Eastern Editor
TED SHIELDS, Assistant Editor
M. L. HANSON, Editorial Assistant
O. D. HALL, Mid-Continent Editor
FREDERICK L. DALTON, Art Director
R. C. HORTON, Circulation Manager

BRANCH OFFICES

CHICAGO
DAVID CARMEN, District Manager
1064 Peoples Gas Building
WAbash 2-2589

CLEVELAND
JAMES K. GILLAM District Manager
19718 Lanbury Ave.
WYoming 1-2587

NEW YORK
J. M. DEMATTHEW, District Manager
11 West 42nd St.
CHickering 4-1969

TULSA
CRAIG ESPY, District Manager
P.O. Box 4055
2-2414 (bus.), 7-9807 (res.)

PUBLICATION OFFICE
198 South Alvarado St.
Los Angeles 4, California
Phone DUnkirk 7-4337

GAS is published monthly by Jenkins Publications, Inc., 198 South Alvarado Street, Los Angeles 4, California. Subscription price, United States and possessions, Canada, Mexico, Cuba, South and Central American countries (in advance), 50 cents the copy; one year, $2.00; two years, $3.50; three years, $5.00. All other countries, $3.00 per year. Acceptance under Section 34.64, P. L. & R. authorized. Member: The Controlled Circulation Audit, Inc.; National Business Publications, Inc.; Society of Business Magazine Editors. GAS is indexed regularly by Engineering Index Inc. Publishers: BUTANE - PROPANE NEWS; Handbook BUTANE-PROPANE GASES; BOTTLED GAS MANUAL; WESTERN METALS. The name "GAS" is registered, U. S. Patent Office.

IN THIS ISSUE

CON ED takes last step to receive natural gas in New York (see pp. 73 and 75).

Contents • December 1950

VOLUME XXVI NUMBER 12

Experts Give Their Views on Ticklish Changeover Problems 25

Natural Gas Fuels Diesel Engine to Feed City's Power Lines 31
By A. J. WOLFF

The Economics of Metering—Part I 34
By G. K. BACHMANN

Cyclic Catalytic Reforming 36
By ORLO B. HOLMAN

Free Circus 38

Lincoln Utility Finds City Gate Peak Shave Plant Advantageous 40
By M. G. COOK

Gas Institute in New Headquarters 42

Mississippi's Management IS Sold on the Value of Corrosion Control 44
By R. B. WILSON

Direct-Fired Gas Heater Cuts Costs in Elderton's "Expandable" School 52

Planning A Corrosion Control Program: V 71

PIPELINE SECTION

Texas Gas Reaches Gates of Gotham 73

How Southern Counties Scraped Its Goleta No. 44 Line 78

Variable Control for Gas Coolers 83
By E. B. SHEKER

Sweeping Price Increases Foreseen if High Court Upholds Wellhead Price Fix 84
By SAMUEL H. CROSBY

COMMENT

HIGHLIGHTS 15

THERMALLY THINKING 19
By Edward Titus

TECHNICAL TRENDS 21
By Guy Corfield

PROMOTIONAL NOTES and NOTIONS 23
By Stanley Jenks

DEPARTMENTS

NEW PRODUCTS 56
NEWS 58
PEOPLE 62
ASSOCIATIONS 66
CALENDAR 68
CURRENT READING 69
PIPELINE PEOPLE 87
PIPELINE NEWS 88
PROGRESS REORTS 93
ADVERTISERS INDEX 94
1950 INDEX TO "GAS" 95

EDWARD TITUS

THERMALLY THINKING

Socialism Gets A Few Socks

FROM TEXAS TO LONDON, there are current evidences of the awakening of the public and of labor unions to the fact that public ownership and socialism don't create Utopia overnight. An outstanding illustration of the trend was the recent U.S. election.

Meanwhile, in London, British trade unionists are becoming impatient at the fact their socialistic overlords are harsher on them and curb their organizing and striking rights more severely than would private owners.

A similar development in this country is evidenced by conflict between the operating union groups in utilities and some of the top management of the principal labor groups. The practical down-to-earth labor union leader knows he can do better for his men under private ownership. This conflicts with the thoughts of some of the dreamers on the top.

In Texas

To turn to the matter of what's happening in Texas: there may be two sides to this, and if there's another side, the public ownership people in Corpus Christi are invited to write us a letter so we can present their side.

But it would certainly appear from the tenor of a newspaper account that the public is well fed up with public ownership.

The heading is: "DANGER RECOGNIZED—CITY'S AGING GAS SYSTEM REQUIRES MANY IMPROVEMENTS."

The story, under the byline of John Anderson, continues:

> Robbing Peter to pay Paul, the city has never completed replacing gas lines that six years ago were called "a serious hazard."
>
> That description was given by P. McDonald Biddison, consulting engineer in February, 1944. Called in when the city system was leaking away 25% of the gas put into the lines, Biddison received prompt action on his report.
>
> A $400,000 bond issue to rehabilitate the system was voted. The money was spent. But the condition of some lines today shows that it did not go far enough.

The superintendent of the gas division estimated that between $200,000 and $400,000 worth of material would be needed to make the system replacements recommended early in Biddison's report. He estimated that spending $100,000 a year for the next ten years would rehabilitate the entire system and put it in good shape.

The writer in the Texas newspaper asserts that one part of the problem is that for several years the city fathers drained off gas revenues and spent the money for general government.

There is no intention here to reflect on the engineers or other officials of Corpus Christi. They are capable officials doing a conscientious job.

The only thought is that when government and the practical politics of running a city and alloting revenues get into the gas business, these engineers and officials can find themselves in one whale of a mess in trying to carry out their duties.

In England

Now to skip over to London for a moment — public opinion surveys show substantial majorities of the British public opposed to the government's plan to nationalize the steel industry, and to proposals to nationalize sugar, cement, meat, chemicals and insurance.

It would not seem too far-fetched to conclude that this trend of opinion might have been caused by results in industries already nationalized — for instance, the gas industry.

And judging by what the London *Observer* has to say, British trade unionists have been shocked by the curbs on their liberties imposed by the "Labor" government. Maybe some of those who don't favor further nationalization in England are members of gas utility unions, 10 of whom were given jail terms for striking.

"In many industries," said the *Observer*, "the union leaders have lost the confidence of the men, and this is due largely to the anamolous situation in which the trade unions have been placed by the government.

"By instituting a planned economy . . . the government has destroyed the free market conditions under which the unions grew up. The union leaders are not trusted because they are felt to be partly associates of the government . . ."

And in the United States we have the recent *Reader's Digest* article by Joseph A. Fisher, president of the CIO Utility Workers of America, who states that "The first victim of public ownership is the labor union and its members."

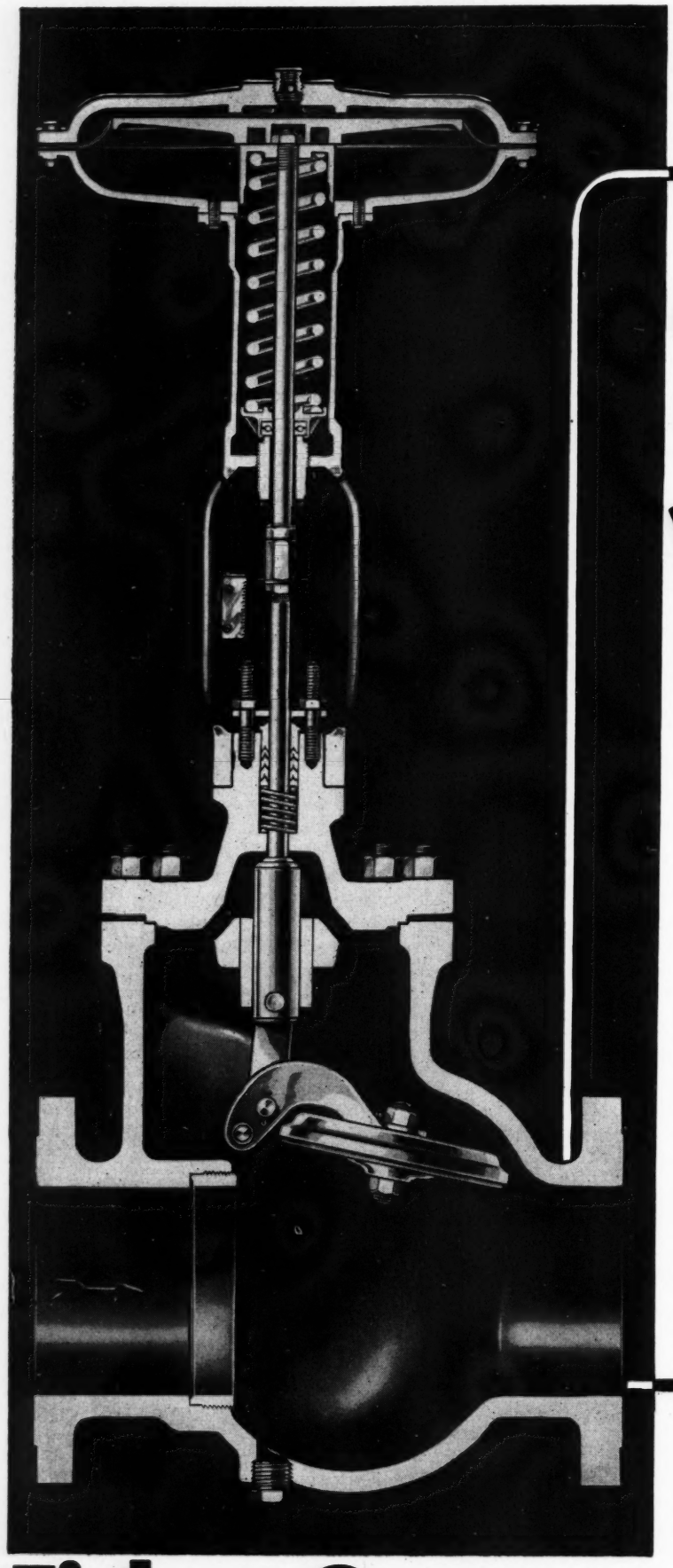
It looks as if the so-called trend to Socialism had taken a licking on a number of fronts the last few months. Alertness and energetic work by opponents of Socialism can push it back farther.

Hoarding

Since mobilization or preparation for war can be used by social planners to advance their own schemes by instituting not only necessary but unnecessary controls, it is well for private industry to work out plans for policing its own actions. It thereby may avoid unnecessary policing by government, which after the end of an emergency could well lead to continuance of such policing.

For instance, one good way for an industry to avoid getting in dutch with government is to find some way of curbing by its own efforts admittedly bad practices such as hoarding. Hoarding steel is hardest on the hoarder. A man who buys steel he doesn't need leads others to do the same. Before he knows it he may be looking in vain for a certain steel that is lying idle in a nearby plant.

The industry and its related industries therefore will certainly shun hoarding, for their own interest, and in the public interest.



New

FISHER®

METER-RUN SHUT OFF VALVE

Allows full rangeability of meter settings. Pneumatic top work, 2 to 15 PSI, operated from meter differential limit controller. The flapper valve lifts clear of the flow stream providing minimum resistance. Pressure drop through valve equal to only 7 ft. of equivalent pipe. Positive shut-off assured with renewable composition valve disc. Designed and built especially for orifice meter multiple tube installations.

Available in flanged iron or steel bodies, sizes 4" through 12".

WRITE FOR BULLETIN 57-TL

FISHER LEADS THE INDUSTRY IN RESEARCH FOR BETTER GAS PRESSURE CONTROL

Fisher Governor Company

MARSHALLTOWN, IOWA

GUY CORFIELD

TECHNICAL TRENDS

Synthetic Liquid Fuels

THE SUBJECT OF SYNTHETIC LIQUID FUELS, their possible volume production in the United States, and their effect on the fuel economy of this nation, has been discussed in technical literature and before the general public for several years. There is general understanding that government agencies, as well as private interests, are investigating the possibilities in laboratory and small and large pilot plant operations; and there has been some criticism of the government activity, particularly from the petroleum industry, on the grounds that this work is unnecessary at this time, there is already abundant source of liquid fuels, the processes will not be economic and industrially competitive in the foreseeable future, the government is seeking another way to enlarge its activity and compete with and exercise control over private industry, etc. Be this as it may, it may be interesting to briefly review the current scope of these investigations.

The government program is being conducted by the U. S. Bureau of Mines, most recently through a newly created Office of Synthetic Liquid Fuels. The program was initiated in 1944 and its continuance has been authorized through 1952 with a total appropriation of $60 million. It now embraces three major fields of investigation: coal hydrogenation, gas synthesis and shale-oil production. Facilities have been established as follows: at Louisiana, Mo., a semi-commercial scale coal-to-oil "demonstration plant" for coal hydrogenation and Fischer-Tropsch synthesis; at Brucetown, Pa., laboratories and pilot plant for research on coal-to-oil processes; at Morgantown, W. Va., and Gorgas, Ala., laboratories and pilot plants for research in synthesis gas production and underground coal gasification; at Rifle, Colo., "demonstration" plant for semi-commercial scale mining and retorting of shale and refining of shale oil; at Laramie, Wyo., experimental station for research in oil-shale retorting and shale-oil refining.

The coal hydrogenation-synthesis gas developments are being watched with renewed interest at this time when benzol and similar products are so vital to defense production and stockpiling, because German information indicates that the resultant liquids will contain substantial quantities of benzene, toluene and xylene.

While the petroleum industry as a group express themselves as opposing these government activities, some individual companies and affiliates are cooperating quite actively or doing their own research, or both. For instance, Standard Oil Development Co., Socony-Vacuum Oil Co. and Union Oil Co. are assisting in the shale oil development, while the latter is similarly active in its own behalf; and The Texas Co., with Hydrocarbon Research, Inc., has developed the Hydrocol process, a modification of the Fischer-Tropsch synthesis, for converting either natural gas or coal to liquid fuels, and plans to operate in its Carthage plant at Brownsville, Texas—which plant, incidentally, has been partially financed by Reconstruction Finance Corp.

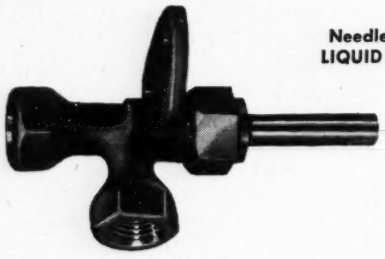
Other interested organizations that have done work principally with modifications of gas synthesis, on both laboratory and pilot plant scale, are M. W. Kellogg Co., Koppers Co., and Pittsburgh Consolidated Coal Co., the latter having experimented with a "fluidized" process for coal conversion to liquids.

A Miracle of Safety

NATIONAL FIRE PROTECTION ASSN., in its *Quarterly Bulletin*, Part 2, October 1950, makes its annual report on "Fire and Fire Losses Classified, 1949," places the loss to buildings at $672½ million, and classifies the 580,000 fires in a table, "Estimated Distribution of U. S. Building Fire Losses by Causes, 1949," which is reproduced herewith:

Causes	*No. of Fires*
Chimneys, flues—defective or overheated	30,000
Sparks on roof	21,800
Defective or overheated heating equipment	54,500
Rubbish	30,000
Combustibles near heaters	8,000
Open lights, flames, sparks	23,000
Hot ashes, coals	10,000
Smoking and matches	95,000
Children and matches	22,600
Electrical, fixed services, fires due to misuse, or faulty wiring and equipment	54,000
Electrical power consuming appliances	21,000
Flammable liquids, miscellaneous, including use for home dry cleaning and starting fires	17,000
Torches, welding, cutting, plumbers, etc.	5,500
Lamps, lanterns, oil stoves	25,000
Gas and appliances	*5,000*
Grease, tar, etc.	11,000
Spontaneous ignition	10,800
Lightning	26,700
Thawing pipes	1,500
Sparks from machinery, friction	2,500
Incendiary, suspicious	6,600
Miscellaneous	36,500
Unknown	44,500
Explosions	7,500
Exposure	10,000
Total	580,000

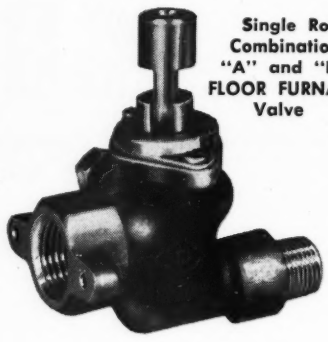
It will be noticed that only two of the above 25 causes (thawing pipes and sparks from machinery) caused a lesser number of fires than gas and appliances; and that gas and appliances were responsible for *less than 1%* of the total fires. When the enormous application of gas, and the fact that it is used to produce heat through the direct medium of *flame* is considered, the performance indicated by the above figures is indeed a miracle of safety.



Needle Adjusting
LIQUID FUEL Valve

Specific customers met with particular design or engineering problems—Detroit Brass was consulted and these valves resulted.

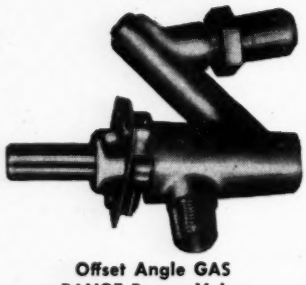
3-Rate ROOM-
HEATER Valve



Single Rod
Combination
"A" and "B"
FLOOR FURNACE
Valve

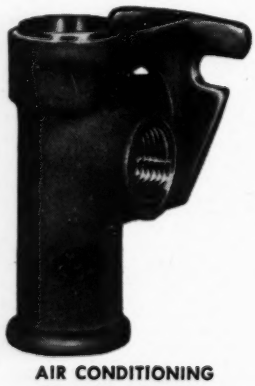
STANDARD or SPECIAL

Detroit Brass Offers Design, Engineering and Production Facilities To Deliver Functional Brass Components That Meet Today's Exacting Requirements.



Offset Angle GAS
RANGE Burner Valve

Appliance Engineers created these valves and Detroit Brass production experience and facilities produced them.



AIR CONDITIONING
Humidifier Bracket

If your problem involves design, engineering, or production of brass valves or fittings, standard or special, we have something to offer you.

Detroit Brass developments in special purpose components are indications of how this company may be of service to you.

When you require assistance in solving a problem Detroit Brass would like to work with you.

Detroit Brass service to many industries is the best indication of what we may be able to do for you. Some of the industries for which we have produced functional machined-brass castings in volume and variety—always on the same top-quality level:

Air Conditioning • Aircraft • Automotive • Beverage • Diesel Engine • Dry Cleaning • Farm Equipment • Gas Appliances • Locomotive • Maritime • Oil Refining Equipment • Oil Heating Equipment • Plumbing • Refrigeration • Rubber • Spray Equipment • Washing Machine • and others.

GAS VALVE DIVISION . . . . . .

DETROIT BRASS & MALLEABLE WORKS

DETROIT 9, MICHIGAN

STANLEY JENKS

PROMOTIONAL NOTES AND NOTIONS

Magnificently

A CURRENT British automatic gas water heater advertisement is headed "Hot Water Magnificently." In fact, that is all the copy, beyond the trade name type and manufacturer's name and address at the foot of the advertisement.

It was the use of the adverb "magnificently" as applied to hot water that intrigued me, and the phrasing itself. If it had said "magnificently hot water," it would have perhaps said it more simply, but not so effectively.

As it was, I went to the big dictionary to get a line on this word "magnificent," which I found defined to mean "great in deed, or exalted in place; characterized by admirable achievements."

And which, my friends, I submit just about tells the story of today's modern gas automatic water heater, for it certainly is (1) great in deed and (2) characterized by admirable achievements.

My hat is duly doffed to that British copy writer, whose ingenious choice of a word stopped me, made me investigate, and, in doing so, made me get a magnificent conception of a magnificent hot water service, thanks to magnificent gas.

Appliance Maintenance

ONE OF THE PROUD BOASTS is that we sell not merely gas, but gas service. That is, when we connect a customer to our system, we assume the obligation that this customer will get every last benefit our service provides. The efficient operation of the appliances that convert the fuel into a heating (or cooling) service is, therefore, of prime importance.

While most gas companies keep this well in mind, there is a tendency in some quarters, especially when new appliance demand is good, to neglect the finer points of keeping existing appliances at the maximum efficiency.

Nobody knows how many electric ranges have been sold through neglected maintenance of gas ranges. Probably most of them, because it is inconceivable, where gas service is available, that anybody would want to replace an efficient gas range with its inefficient and less dependable electrical prototype.

The $64 question has always been, how far should we go with the "free" maintenance of appliances. And, also, whether we or plumbers should do the work.

The problem has its angles. However, if we are selling gas service, surely burner and thermostat adjustments are legitimate maintenance, chargeable to operating expense, and basically our responsibility. Replacement of parts beyond the guarantee period, it would seem, belongs in a different category. It should carry itself at least, and, if plumbers can and are willing to handle the business on a reasonably satisfactory basis, they deserve the opportunity to participate and thereby strengthen the industry by becoming more a part of it.

Gas Lighting

WHILE THERE IS THE INCLINATION to brush off gas outdoor lighting as out-of-date, it must be remembered that gas street lighting is still used extensively in certain Eastern metropolitan areas; that it is modernized and very much in use in London and generally throughout Great Britain; and that it still has a greater inherent dependability than electricity for emergency use.

Ideas for having outdoor gas lighting available where electric failures are critical are percolating in the industry.

Gas lighting has undoubted merit in itself. For us, it represents additional load, and is yet another way for us to serve the public usefully.

Tougher Going Needs Better Salesmanship

THE FIRST INNOCENT GOATS when inflation hits, as it is hitting today, are the privately managed public utilities. Unlike manufacturers, for example, who can evaluate the market, the competitive situation, and price for adjusted costs, the regulated public utility is stuck with a rate schedule, relatively inflexible in the inflationary spiral.

So the gas industry has to oppose inflation for its own good, if nothing else. Incidentally, it can very proudly point to its own record of "holding the line" while the new deal dollar value wreckers have been on the spree.

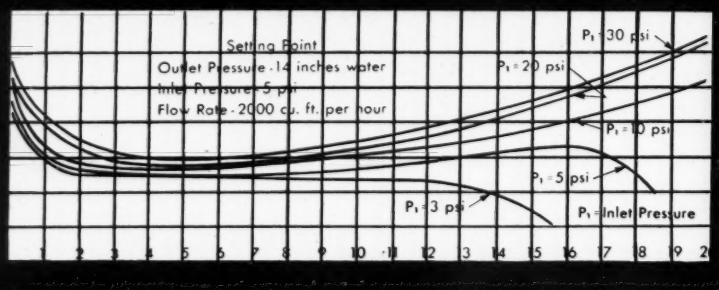
The recent amendments to Regulation W have undoubtedly cut into our appliance sales. Many feel the changes were too drastic. But drastic measures are badly needed these days to curb the economy before it is completely wrecked to the point where Uncle Joe and his cohorts can move in bag and baggage.

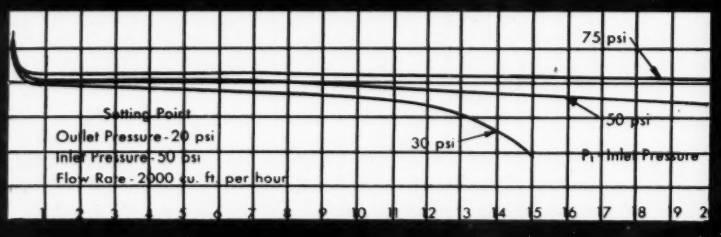
A manufacturer friend, facing fantastic pay demands from his union recently, made an unofficial but worth-while study to find the real reason. Of course, he found the power-drunk, autocratic labor leader in the picture. However, the real driving force behind the demand sprang from the over-extended indebtedness of the average worker, needing more money to meet the monthly payments on his new car, deep freeze, television set, etc.

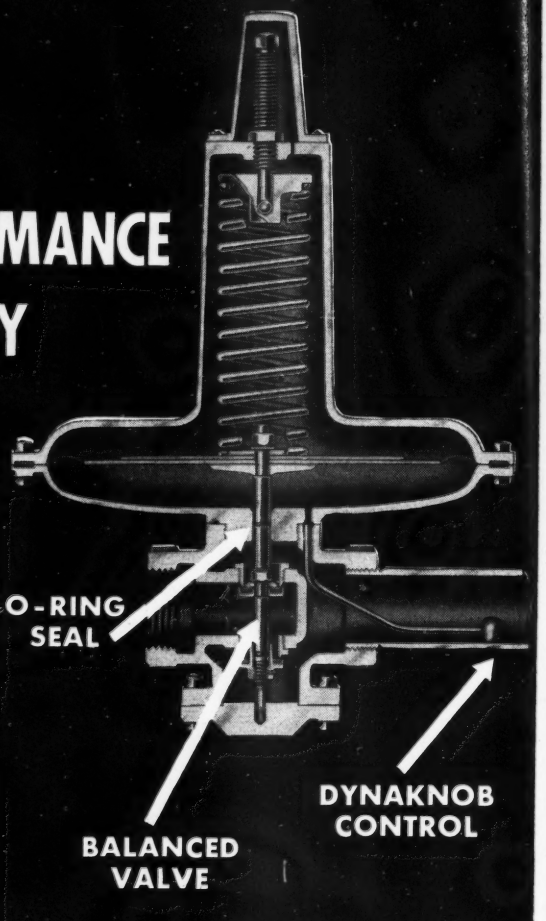
Yes! It will be tougher to sell appliances. Let's take it in our stride and recognize it as a challenge to our salesmanship.

CHAPLIN•FULTON

VERSATILITY and TOP PERFORMANCE with EXTREME SIMPLICITY


Setting Point
Outlet Pressure - 14 inches water
Inlet Pressure - 5 psi
Flow Rate - 2000 cu. ft. per hour
P1 = 30 psi
P1 = 20 psi
P1 = 10 psi
P1 = 5 psi
P1 = 3 psi
P1 = Inlet Pressure





WIDE VERSATILITY—Model 46 controls outlet pressures from a few inches of water to 20 lbs., covering the ranges normally used in distribution, commercial and industrial installations. Also inlet pressures to 125 lbs. and flow rates to 50,000 c.f.h.

TOP PERFORMANCE—The *Dynaknob* principle insures accurate outlet pressure in spite of varying flow rates and varying inlet pressures. Soft valves assure complete shutoff.

The low and high pressure performance charts above indicate the control accuracy.

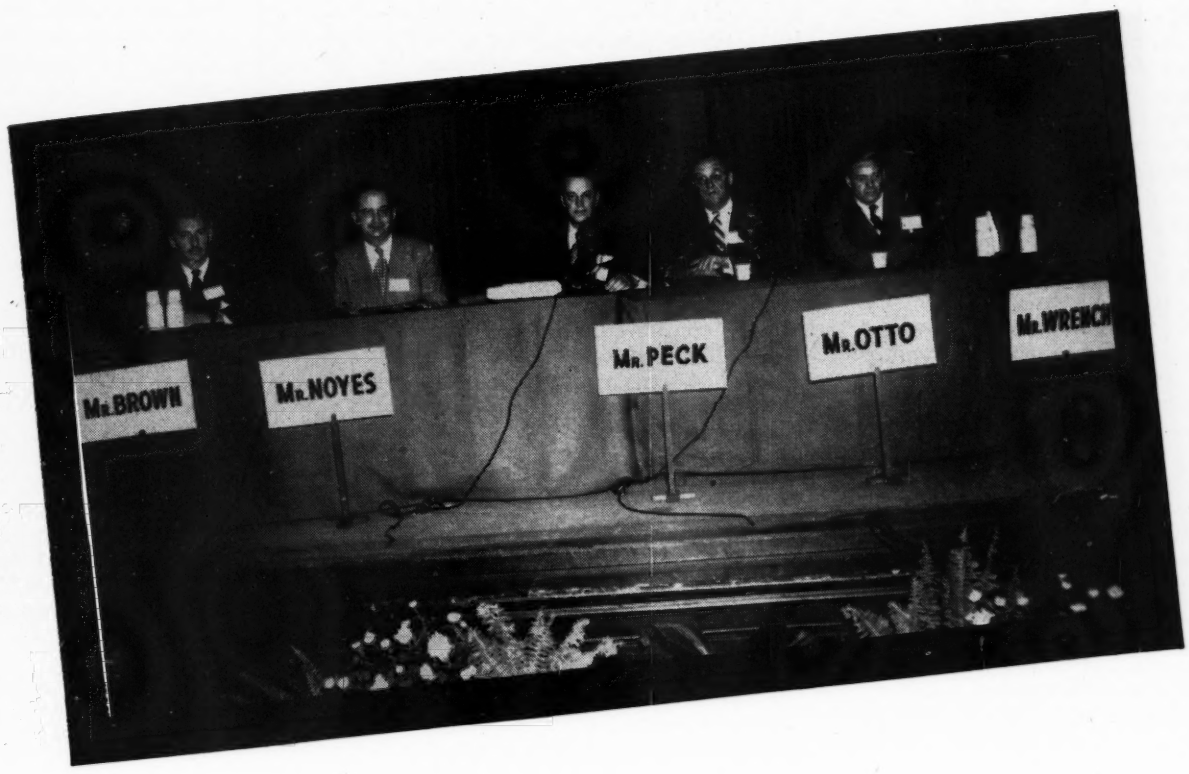
EXTREME SIMPLICITY—A spring-loaded diaphragm directly connected to balanced valves, reduces to a minimum the service and maintenance requirements.

Made in 1, 1¼, 1½ and 2-inch sizes.

WRITE FOR BULLETIN NO. 46

ACCURATE CP MFG CO DEPENDABLE

Chaplin-Fulton
MANUFACTURING COMPANY



Experts Give Their Views on Ticklish Changeover Problems

In the northeastern section of the U. S.—New Jersey, Metropolitan New York, and New England — 20% of the nation's population lives and works. Far from the gas fields of Texas and Kansas, it has long been fueled by manufactured gas. Now, the big pipelines are bringing natural gas to the area, and with the wonder fuel come the technical and managerial problems described in one of the most important words in the industry's working dictionary: Changeover.

As an aid to the solution of these problems, the AGA scheduled a panel discussion on the subject for its annual convention last October. Although readers will recall that "GAS" published a similar study last May, titled "What's Your Question?" which covered some of the same ground, the editors have adapted the AGA panel for presentation herein, feeling that the additional facts and opinions contained in this work are an important complement to that study.

Moderator for the AGA round table was Irving K. Peck, vice president, Manufacturers Light & Heat Co., Pittsburgh. Industry experts who attacked various phases of the changeover difficulties were Dudley B. W. Brown, vice president, Milwaukee Gas Light Co.; Howard B. Noyes, vice president, Washington (D.C.) Gas Light Co.; Robert W. Otto, president, Laclede Gas Co., St. Louis; and Harry K. Wrench, president, Minneapolis Gas Co. Each panel member is a specialist in one or more phases of the industry: Mr. Noyes is a technical man, Mr. Brown is a manufactured-gas veteran who helped his company to make the conversion, Judge Otto, with 12 years on the bench, has invaluable legal experience, and Mr. Wrench's company experienced a phenomenal success in converting to natural gas in the face of stiff competition. (The story of this success, in terms of sales, was told by Mr. Wrench in September 1950 "GAS.")

MR. PECK: The first question I would like to have Judge Otto answer: *As a result of the changeover problems and experiences of the many companies in many places in recent years, could you formulate a general policy and procedure on publicity and public and customer relations, applicable to those companies now facing a changeover?*

JUDGE OTTO: The conversion to straight natural gas is a challenge to the planning and managerial ability of any gas company. The extent to which it is carried out successfully depends upon the degree to which the work is planned in advance and the efficiency with which the work is executed, plus a thorough education of the customers of the utility. The conversion of the Laclede Gas Co. system to 1000-Btu natural gas began in St. Louis May 16, 1949, and by Dec. 6 of that year the entire city and county area served by the company was completed. The changeover required the adjustment and conversion of more than 750,000 appliances for the company's

310,000 customers.

Immediately after the decision was made to convert to straight natural gas, a comprehensive program of education of the public and the customers of the company was formulated. It consisted of newspaper advertising and publicity, direct mail, together with handbills, and direct customer contact. It is strongly urged that you meet with the representatives of the press, that is, not only the daily press, but the community papers as well. This should be done by personal contact by a representative of your company who will be fully conversant with what is entailed in making a conversion.

We felt from the beginning, and found out later that it was true, that newspapers regarded a changeover to natural gas as of sufficient news value to the public to warrant stories and feature articles on this particular work. Because of the reader interest, articles of this kind are very helpful in doing a job such as this.

It was also determined that it would be of great benefit to educate the various municipal officers and city officers in the communities which the work covered, and this cannot be stressed enough. The suggestion that I would make to you people who contemplate converting over to natural gas or a higher Btu gas is that you use an auditorium or assembly hall to house an actual conversion demonstration of a water heater, a range, and a conversion burner, showing just how the respective items are converted.

Civic Cooperation

At this type of demonstration we invited for lunch the mayors, city counsellors, and city attorneys of the various municipalities, and an actual demonstration of a conversion was made in their presence. The meeting was thrown open for questions. The purpose of this demonstration was to insure that the municipal officers were fully informed as to the tremendous task and what it entailed, so that if any complaints should arise, and should a customer or inhabitant of the community go to a municipal officer, the officer, fully informed, and educated to the problems of conversion, could eliminate many grievances that might otherwise come to the utility. I cannot stress the importance of this too much. Representatives of the press were present at this demonstration. There were 85 present.

In addition to holding meetings of this nature, it is beneficial to contact personally the officers of the municipalities you serve. This will inform them as to the time the conversion adjusters will be in their communities, and will advise them that during this period the members of the community will be called on and their appliances adjusted. By having a representative of your company personally notify these officials, it smooths the way of the conversion and assists in satisfying any complaints that might occur within the municipality.

Both the police and fire departments are interested in any of job of this scope. All police departments should be notified of the nature of the job, the number of men who will be working as conversion adjusters, and the time when the conversion crews would be in given areas. The police chief in the City of St. Louis briefed all of his district captains on the conversion work, informing them that approximately 500 men would be working in an area, that it would be necessary to park cars, and that sectionalizing crews would often work on busy streets to operate valves to sectionalize districts. In this manner, our company was able to gain the cooperation of the police to combat traffic and to assist us by the use of their squad cars. District fire stations should be alerted throughout the conversion, to be prepared for fires and other types of accidents, although during our conversion it was never necessary to call upon them.

Most conversions are done during the summer months, when public and private schools are closed and are often without attendants. It is desirable to contact boards of education and heads of institutions to assure the access of the conversion adjuster to these buildings.

The customer contact departments play an important part in any conversion operation. To perform their work intelligently, they must be informed of every phase of the operation. Training meetings should be held with telephone clerks and personal contact employees, explaining the whole program and their part in it. Meetings should be held with department heads and key personnel, explaining the conversion operation and the general procedure of the work. During conversion, there must necessarily be changes in the procedures for handling cutomer complaints and service work in districts recently converted to natural gas.

It is helpful to plan the new procedures for handling the conversion complaints and service calls for your customer contact and service departments. Procedure manuals should be prepared for employees in telephone divisions and personal contact departments, thus minimizing inconvenience to the customer and the company. Department heads, key personnel, and telephone clerks should be informed of the daily progress of the work and preparation of the district being converted in the immediate future.

Service Complaints

Immediately after the conversion work is completed in a district, the service complaint calls increase. To meet this increase our company trained 60 to 100 service men. They were trained to accept the additional work load imposed on them by complaints arising from low pilots and maladjustment of burners, as well as to convert appliances where the adjuster could not gain access at the time the conversion was taking place in the area.

MR. PECK: *What are the comparative operational costs with catalytically cracked natural gas compared to thermally reformed natural gas?*

MR. NOYES: The catalytic process is basically that of reforming natural gas at high temperature in contact with a catalyst and steam or air. The resulting gas is of relatively low specific gravity and heating value and is primarily composed of hydrogen, carbon monoxide, and inerts, the percentage of the latter being in proportion to the amount of air used. This process is usually performed in either a combustion shell or in tubes.

Thermally reformed natural gas is usually produced by passing natural gas through the hot solid fuel bed in a water gas set during a portion of the normal water gas cycle, with result that some of the natural gas constituents are reduced to hydrogen and carbon. This natural gas carbon therefore, displaces carbon which otherwise would be obtained from solid fuels. The hydrogen released in this process is then blended with blue gas during the run cycle producing a gas of relatively low heating value which is subsequently cold enriched.

It is apparent from this description of the two processes that comparative operating costs are dependent to a large degree on the relative costs per therm of natural gas and solid fuel.

Carl A. Schlegel, vice president of United Engineers & Constructors Inc., in a recent trade journal article* cites the experience of one gas company which found that with coke costing $16 per ton and natural gas 30 cents per Mcf, the production of catalytically reformed natural gas enriched to 530 Btu was approximately four cents per Mcf

*GAS, February 1950, pp. 26-29.

less than that of thermally reformed natural gas.

About half of this saving is reported to be fuel saving because of the substitution of natural gas for coke, while the remaining economies are effected through reduced labor, purification, and maintenance costs.

The catalytic method produces relatively little nitric oxide as compared with the thermal process. Since there will be less chance for gum compounds to be formed in the distribution systems, this feature should reflect lower appliance servicing costs.

MR. PECK: Thank you, Mr. Noyes.

Here is a problem that bothers the New England and eastern seaboard companies, and I will ask Mr. Brown to tell us *what proportion of standby production facilities should be maintained to provide for a natural gas outage?*

MR. BROWN: The problem presented in this question is one which is so vitally affected by conditions peculiar to each local situation that it is felt no general rule can be applied.

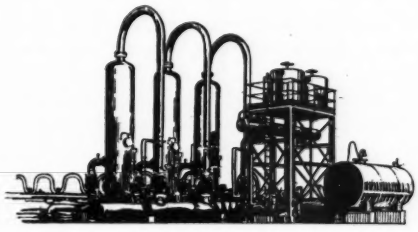
Consideration must be given to such questions as the probable reliability of the natural gas supply; whether the distribution area is fed by a single pipeline or more than one line; alternate sources of natural gas such as local storage fields; the degree of househeating saturation anticipated; amount of readily interruptible load; the short and long term growth factors; and many other considerations which are dissimilar among communities. Because of these variables, it is virtually impossible to arrive at a common denominator from which a formula can be derived.

Maintain Standby

It is my personal opinion that it is desirable to retain as many production facilities for standby as possible. In some instances, such as coal gas plants, existing facilities cannot be used for standby. Water gas plants, however, converted to high-Btu oil gas production and liquefied petroleum gas plants are well adapted to standby services. Coke plants can also be satisfactorily employed if a market can be found for daily excess coke oven gas released.

In our own (Milwaukee Gas Light Co.) case, we have retained as standby all of our production facilities; that is, a water gas plant, now in the process of conversion to high-Btu oil gas; an LP-Gas plant, and a coke plant. At present this represents approximately 80% standby capacity. Because of our geographical location and the high degree of industrialization in the area the percentage will probably drop considerably during the next two years.

MR. PECK: *How has the maximum hour been met when many pipeline systems require that the take be at a uniform rate over the 24 hours?*



MR. BROWN: The maximum hour has been met where pipeline systems require the take to be at a uniform rate by one or a combination of the following:

1. Use of holder capacity to supplement natural gas take.
2. Use of manufactured gas standby facilities at times of extreme peaks.
3. Installation and operation of compressed gas storage facilities.
4. Indirectly, the use of storage fields adjacent to distribution which are filled during seasons of low consumption.

MR. PECK: *With the advent of natural gas in a system previously distributing manufactured gas, has it been necessary to maintain the same ratio of holder storage capacity to sendout as was the previous practice?*

MR. BROWN: In most cases it has not been feasible to maintain the same ratio of holder storage capacity to sendout as was the practice with manufactured gas. To maintain the same ratios throughout the expansion in sales volume, which usually follows the introduction of natural gas, would be complicated and costly. Added or different distribution points complicate construction of added holder capacity and the cost of continued additions to holder capacity to keep pace with expansion would be excessive.

MR. PECK: *What has been the experience with the placing of coke oven or water gas plant personnel, when production facilities are abandoned on the introduction of natural gas, and have companies successfully utilized production plant standby operating crews on other work when not required for production; and how have such things been handled as seniority between departments, re-education on new jobs, severance pay and hourly rates?*

JUDGE OTTO: The conversion to straight natural gas had been foreseen for several years by Laclede, and in the light thereof, the company had adopted a rather complex dismissal pay plan that, for the most part, set the procedure for handling its coke plant personnel upon abandoning this type of production. The workability of the plan, however, was augmented by two factors.

First, Laclede sold its coke plant to a merchant operator, thus making it possible for a large percentage of the employees to remain working at the coke plant under the new owners.

Second, Laclede's tremendous growth required expansion in all directions which made it possible for the company to absorb all coke plant employees who wished to remain with the company in other departments.

Personnel Plan

In operation, Laclede's experience in abandoning its coke plant operations was as follows:

1. In the first instance, operations and personnel worked out a new table of organization for the manufacturing department which was to remain after conversion to natural gas. This in effect amounted to providing for skeleton crews to maintain the remaining manufacturing facilities for use during peak shaving operations.

2. Then, under the provisions of the dismissal pay plan, all employees in the manufacturing department were given an opportunity to elect any one of the following choices:

(a) Employees whose jobs were abolished could elect to be terminated from Laclede's payroll and receive dismissal pay, and thereby be free to seek employment with the new owner of the coke plant or elsewhere. The amount of dismissal pay received by an employee making this election was 60 hours' pay for each complete year of company seniority up to the time of termination.

(b) Any employee in the manufacturing department could elect to be transferred to one of the available jobs in other departments within Laclede. Any employee making this election was allowed a 120-day period in which to train and qualify for the job to which he accepted transfer; such employee received either the job rate of pay for the job to which he accepted transfer or the rate of pay he was receiving at the coke plant, whichever was higher.

(c) Any employee not exercising one of the above two options could bid on jobs remaining in the manufacturing department after disposition of the coke plant, and at the same time make an election either to accept transfer to remaining available jobs in other departments or to be terminated and receive dismissal pay, in the event such an employee was not a successful bidder for a job in the remaining manufacturing department. To reiterate, any employee who elected to remain in the employ of Laclede was guaranteed that there would be no reduction in salary.

(d) Any employee in the manufacturing department who was 65 years old or older could elect to be retired under Laclede's pension system and also receive dismissal pay. Before abandoning coke plant operations, Laclede had approximately 375 employees in the manufacturing department. Of these approximately 140 elected to be terminated, thereby receiving dismissal pay and going to work either for the new owner of the coke plant or elsewhere. About 140 elected to remain with Laclede and accept an available job in other departments. About 90 employees remained in the manufacturing department. Five elected to retire and receive a pension plus dismissal pay.

In conjunction with the application of the above procedure Laclede successfully negotiated an agreement with the union whereby peak shaving operations are to be construed as an emergency, thereby giving the company the right to

recall any former manufacturing department personnel or to utilize any other personnel deemed necessary, in its discretion, to carry out peak shaving operations.

MR. PECK: Thank you, Judge Otto. Mr. Noyes: *Will the introduction of a mixed gas of 650 Btu, composed of reformed natural gas enriched with straight natural, cause increased distribution system leakage? Will this mixed gas with little or no carburetted water gas as a component increase meter diaphragm trouble when it replaces carburetted water gas?*

MR. NOYES: With respect to the first question, no direct answer can be given, since the possible increased leakage effect is dependent upon a number of variable factors which must be carefully studied in each situation.

First, if the mixed gas is of a higher heating value than the gas formerly distributed, it must be expected that the percentage of unaccounted gas will increase, since the cubic foot volume of existing leakage will remain at least the same while the volume of sendout gas will be reduced proportionally to the change in the heating value.

Leakage With Natural

The relative amount of water vapor content in the new and old types of gas is a determining factor in whether the volume of leakage will increase. If the gas formerly distributed were completely saturated, the yarn in lead joints in a cast iron system would be expanded because of the moisture present. If the substituted gas were only partially saturated as a result of mixing dry natural gas with the reformed gas at the holder outlet, it may be anticipated that the yarn in the joints will give up moisture and shrink with the possibility that increased leakage may occur.

However, if the gas is mixed prior to entering the storage holder, the distributed gas will probably be found to be saturated and no additional leakage may be expected.

The water vapor content of the gases has a negligible effect on leakage on steel mains and on cast iron pipe with mechanical joints.

Of course, in this analysis it has been assumed that distribution pressures are unchanged after the conversion.

Referring to the meter question, it is probable that the mixed gas with its little or no oil vapor content will absorb the oil which had been deposited on meter diaphragms during the period of carburetted water gas distribution. This condition may cause the leather meter diaphragms to harden and shrink to some degree.

MR. PECK: Thank you, Mr. Noyes. *Can you tell us what is the effect of changeover to straight natural gas on gas meters, and should practices on meter repairs and diaphragm replacement be commenced well in advance of the changeover, if this is possible? Further, what is the effect on gas mains and joints? Also, the effect on district regulators and house governors?*

MR. NOYES: No generalized answer can be made to these questions since numerous factors which vary among companies will determine these effects.

A change from a saturated carburetted water gas distribution to dry natural gas will probably result in absorption of oil and water from the meter diaphragms with consequent hardening and shrinking and a trend toward a fast proof. If the manufactured gas had been distributed under high pressure directly to customers, or if high-pressure gas had been delivered into a low-pressure system for distribution to customers, it may be expected that meter diaphragms will be affected to a lesser degree.

Past meter maintenance practices and the degree of impurities which may have been present in the former gas are other factors which should be considered.

I do not know of any meter maintenance procedure which, if inaugurated in advance of the changeover, will eliminate or substantially minimize the effect of the changed gas conditions. It has been suggested that synthetic diaphragms may be the answer to this problem but I don't believe conclusive results have been demonstrated to date.

As mentioned before, dry natural gas will absorb moisture which may have been present in the yarn in lead joints thus causing increased leakage. Some companies have instituted oil fogging or steam hydration to minimize this effect. Others, after individual system analysis, have preferred not to condition the gas and have utilized anti-leak compounds to seal the joints.

Usually, it has been found that regulator diaphragms are not affected to much degree by the changeover unless high concentrations of impurities had formerly been present.

In summary, the effect of a natural gas changeover on the distribution system is a function of the changed gas conditions such as oil vapor content, relative humidity, and impurities. The specific answer can be found only after detailed analysis of each individual case.

MR. PECK: Thank you, Mr. Noyes. Mr. Wrench, *what would you say that in a partial or complete changeover, the needs are for oil fogging, odorization, hydration gas, and use of low pressure holders for conditioning?*

MR. WRENCH: In an old manufactured gas system, the customers expect an odor with gas, and we believe the gas should be odorized, to protect against loss of gas and loss of life and property by customer and company.

Experience has shown that oil fogging and automatically controlled humidification are necessary from the start, after changeover, to avoid an increase in leakage of the distribution system as well as to prevent dust troubles with attendant outage service calls. During the winter the dew point of the gas should be kept a few degrees below the temperature of the mains and services to avoid freeze-up troubles. Low pressure holders can continue to be of use but if they are of the water seal type and without an oil film over the water in the tank, saturated gas leaving the holder can cause freeze-up troubles in the mains and services. The moisture freezing out comes out as solid ice rather than slush and drip oil as with manufactured gas.

MR. PECK: Thank you. Secondly, Mr. Wrench, *assuming a company plans to change from 530-Btu manufactured gas to an 800-Btu mixed gas, with possibility that some years hence it will change to straight natural gas, can the changeover be a two-part job, namely a major appliance conversion when going to 800-Btu, and later a minor changeover job when going to straight natural gas? If so, what are estimated costs of the first and major conversion, and, secondly, the later minor change to straight natural gas? Is this the best way to do the two-part job?*

Two-Step Method

MR. WRENCH: In changing over from 530-Btu manufactured gas to 800-Btu mixed gas with the possibility of changing to natural gas at a future date, it is good practice to do this job as a two-part job.

The first major conversion would involve the following:

1. Drilling ports or increasing port areas of burners
2. Change of orifice size in burners
3. Change of orifice in pilot burners
4. Air adjustment

The second or minor conversion would involve the following:

1. Change of burner orifice
2. Air adjustment

The prevailing cost of a major conversion by outsiders at the present time is from $8 to $15 per meter, depending upon the number of appliances per meter.

From this I would estimate that the cost of a second conversion would be from $7 to $10.50, if the meters have the same appliance saturation.

The second conversion cost is taken at 70% of the first cost. The amount of work involved in the second is 50% of the first but the overhead and travel time is duplicated and, therefore, I estimate the cost at 70%. I believe the

above costs can be reduced if the utility does its own conversion.

I don't know of a better changeover than the above, which has already been proved; however, if I were to make the changeover, I would do the following:

1. Distribute an 800-Btu mixed gas having the same gravity as the ultimate natural at a 9-in. pressure.

2. Sectionalize the city into areas that can be converted in from one day to a week.

3. Drill and change orifice sizes on all burners and pilots to conform to the ultimate natural gas that you will furnish some years hence. This means keeping your distribution system under 9-in. w.c. pressure during the years you are distributing 800-Btu mixed. The one disadvantage to this is the increased leakage due to the higher pressure which would be about 12% of your present leakage. This may be an advantage also, since the increased leakage may make you fix your leaks.

When natural gas is finally available, reduce your pressure to 6 in. and have a few extra men for making air adjustments which may be required in a few instances and to take care of pre-mix burners.

This last method would eliminate the cost of a second conversion and if it is done properly, I am sure will work well.

MR. PECK: Judge Otto, for purposes of emergency curtailment, *what type of program or method has been found satisfactory? How is such a program set up? What organization is necessary? What is the order of curtailment? Just how is such a program put into effect, and what results may be expected?*

JUDGE OTTO: What type of program or method has been found satisfactory? An organization adequate to take care of emergency needs should be set up. Generally speaking the Industrial Sales Division can handle curtailments more adequately since they are well acquainted with industrial customers through their contacts. They are in a position to get in touch with the right people at the right time who understand the overall program.

How is such a program set up? It is necessary generally for the organization set up to handle curtailments to be in close contact with the pipeline company serving the supply and the curtailment group is required to analyze all loads of interruptible and firm gas customers as well as the type of product being manufactured and the requirements of the gas application for processing, etc. Individual cards should be set up on customers showing this analysis and at what percentage rates the total load may be interrupted without damaging products in the process of manufacturing. The degree of curtailment is usually established by the pipeline company supplying the gas.

What organization is necessary? The size of the organization required will depend on the amount of customers a

company supplies and the depth of curtailments required. The organization should be set up prior to curtailments and definite information concerning each customer should be prepared, that is: telephone numbers of firms to be called, names of individuals in these companies to be contacted, and the nature of business and equipment should be known so that when calls for curtailments are made, the individual calling will have all necessary information at hand as ordinarily the job must be done as quickly as possible.

What is the order of curtailment? Interruptible loads should be curtailed first, large firm loads next.

Curtailment Procedure

Just how is such a program put into effect, and what results may be expected? After the organization has been completed the next step is to call the customers on the telephone when curtailments are required. If the customers have been advised ahead of time that curtailments will be required and given the reason for curtailments, good results should be expected. In other words, results to be expected would depend upon the effort made ahead of time to sell the customers on the necessities for curtailment.

MR. PECK: Thank you, Judge Otto. Mr. Wrench, *assuming that interruptible industrial loads are important in winter operations, to improve load factors and to hold down demand charges, what type of interruptible business has been most readily secured? What is the economic minimum size customer to which interruptible gas can be sold? What price can a company expect to obtain for such gas in comparison with current prices for firm gas, solid, or liquid fuels?*

MR. WRENCH: The most readily secured interruptible business is large boiler loads where the investment for burners and standby equipment is small in proportion to the volume used.

The economic minimum size customer depends entirely on the size of the town and the number of customers which may be obtained. Minneapolis has set its smallest customer for a minimum use of 2 MMcf per month.

The price for gas when the customer is initially connected would probably have to be a little lower than in later years so that the savings will allow the customer to pay for the cost of conversion. I would suggest that the margin be rather narrow to start with.

Restrictions

MR. PECK: Thank you, Mr. Wrench. I have another question for you. *What forms or methods of limitations or restrictions can be placed on central heating sales in order to hold them within limits of the ability of the company to supply the necessary gas?*

MR. WRENCH: Where a company operates under a state utility commission an order can be obtained from the commission limiting the number of heating jobs a utility can take. Such restrictive orders have been upheld by courts.

In our company we operate under a utility committee of the city council. We had an ordinance passed that the building department cannot issue permits for gas heat unless applicant has permit from the gas company.

MR. PECK: Thank you. *What has been the general history for the five years after the advent of natural gas for mixing or straight operation? That is, the Mcf sales, rate reductions, increased fixed capital investments, earnings, etc.*

MR. WRENCH: Our gas sales in 1936 were 3,162,516 Mcf at $.144 per therm and rose in 1940 to 5,441,990 Mcf at $.112.*

MR. PECK: Thank you. Now Judge Otto: *Should not rates following advent of natural gas include an automatic escalator clause in case FPC later allows increased rates to pipeline companies supplying the utilities?*

JUDGE OTTO: I do not believe that an escalator clause should be inserted in a utility rate filing to provide for the cost of authorized increases in cost of gas from its suppliers because the cost of gas is but one of the components of the cost of service to the utility's customer.

MR. PECK: Thank you. Mr. Noyes, *in connection with a changeover to a higher-Btu gas, what are the advantages and disadvantages of substituting a therm rate for the ordinary volume cubic foot rate?*

MR. NOYES: The therm rate, if inaugurated by a company before the beginning of a changeover to higher-Btu gas, presents an outstanding advantage

* For further information about Minneapolis Gas Co.'s rapid sales growth, see "How Minneapolis Increased Gas Sales Seven-Fold," by Harry K. Wrench, *GAS*, September 1950, pp. 23-26.

customer poll

Equitable Completes Commercial Census

EQUITABLE Gas Co., Pittsburgh, has learned just about everything it could care to know about the 18,000 commercial gas customers it serves.

In the first step of a three-pronged research program, Equitable carried out a full "census" of its commercial gas users last summer, using 15 specially trained employees for the job. The company expects to do the same thing for its industrial and domestic customer lists in the immediate future.

Results of the census, in which each customer was interviewed personally, will help Equitable plan its expansions wisely, and also have furnished invaluable data as to exact number of customers, types of equipment in use, and uses to which gas is put. Preliminary results have shown that company estimates of gas-heat saturation in commercial establishments were off by as much as 25%, and that the previously estimated maximum commercial gas heating potential was in error by about 2 billion cu ft.

Just what inroads competitive fuels have made in Equitable's commercial sales will be revealed when final tabulations of the census-takers have been incorporated into an overall picture. IBM "census cards" will contain information as to type of customer, size and use of buildings, gas use, competitive fuel use, and sales potential.

Since Equitable's 18,000 commercial customers vary so widely in size and type of operation, the company discounted the value of a survey that would have taken only a sample of the total number of customers. Instead, Equitable decided on a full census operation. F. B. Jones, manager of the economic and management research department, and Robert Barnes and S. D. Forward, research analysts, carried on planning of the program.

In setting up the research program, they used the company's existing set of IBM cards showing names and addresses of customers to be interviewed. From this deck, they produced another IBM deck of cards, which will conduct electricity when marked with graphite pencils, and a code sheet for the various questions to be asked.

The 15 men who performed the job were given an intensive eight-day training course, which included basic facts about the natural gas industry, reasons behind the census, and how to conduct the interviews. The men were split into teams, with group leaders driving company cars and each team working a different area. During the census-taking, weekly meetings were held to clear up field problems and map out the next week's activity.

After the census was taken, the men who gathered the information were eligible for an essay contest on the subject "Status of Equitable's Public Relations — How They Can Be Improved." Cash prizes were awarded.

in that customers may review the rates before and after the changeover on the basis of a common denominator.

For instance, if 500-Btu gas were sold for $1 per Mcf and a changeover were made to 1000-Btu gas with no rate reduction, the price of the 1000-Btu gas on a volume basis would be $2 per Mcf. This situation results in a psychological obstacle which must be overcome public-relations-wise to avoid the customer feeling that rates are actually being increased. If the therm form of rate were used, the price of gas, namely $.20 per therm, would remain unchanged after the changeover.

The therm rate results in a simple comparison of rates with those of other companies using therm billing even though the heating values of the gas distributed may be different.

Where the heat content of the high-Btu gas may vary within substantial limits, gas companies have found that therm billing will easily adjust for such variations whereas the volume billing method requires a change in the unit price per Mcf.

The disadvantages of the therm rate are:

1. A change in a measurement unit to which the customer may long have been accustomed.
2. Billing procedure is more complex in that the meter readings in cubic feet must be converted to therms by using factors.

After experience with both forms of rates, I must confess partiality to the therm basis and believe it posseses advantages.

MR. PECK: Thank you. And now a short question. Mr. Brown, will you take this one? *Should not improved earnings be realized following the transition to natural gas before definite rate reductions are made?*

MR. BROWN: A one-sentence answer to this question would be, "Fine, if you can do it."

If the company has been previously operating at a loss or on a low return basis, it may be possible in some localities to operate for a trial period with natural gas on manufactured gas rates. In most instances, however, I should say that the change from manufactured gas to natural gas is definitely associated, both in the minds of the public and the cognizant regulatory bodies, with a rate reduction of some sort. Where it is necessary to secure a certificate of convenience and necessity for the introduction of natural gas it will often be necessary to indicate the anticipated economies to customers as a condition for the changeover.

Going a step further, in some cities it has been necessary to make an advance commitment as to the extent of the initial rate reduction before the city council would act favorably on the introduction of natural gas.

In summary, I believe it would be difficult to introduce natural gas into a community without some rate reduction. If the earnings of the company are poor, a token reduction may be made at first and a secondary reduction when improved earnings have been realized.

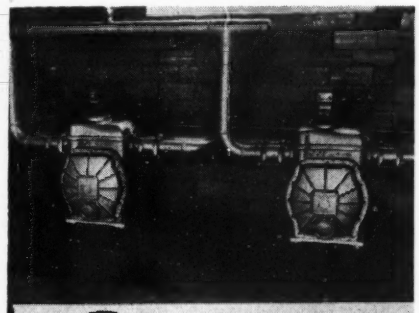
MR. PECK: Here is another one for you. *Since electric competition may most seriously affect our straight domestic sales, should not the greatest reduction be made in cooking and water heating rates and much lesser reductions in house heating rates following the advent of natural gas?*

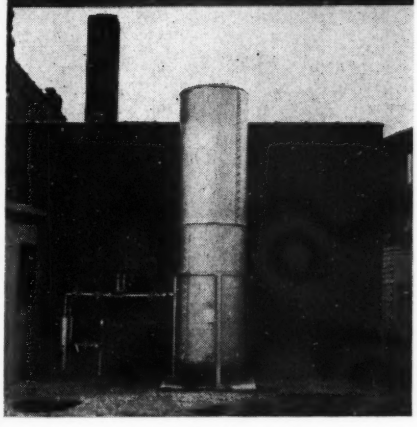
MR. BROWN: I do not believe that reducing cooking and water heating rates far below the corresponding electric rates for these services will materially reduce competition. Some reduction in these rates should be made, if for psychological reasons alone, and the resultant rates should at least be on a par with the electric rates. Below this level, I do not feel that drastic reductions will greatly affect the retention of old customers or the acquisition of new ones, with the possible exception of new construction. I feel that as long as gas rates are not out of line, competition in the straight domestic sales field is more a problem of sales promotion and customer service.

The demand for space heating, on the other hand, is much more elastic. The reduction of heating rates to below the cost of other fuels will produce rapid expansion in this field. The extent of increase in house heating and the rapidity of its incidence will vary almost directly with the extent of rate reduction.

MR. PECK: Thank you. *In amortizing conversion costs, what is a recommended period when applying to state utility commissions, and is such approved period generally acceptable to the Internal Revenue division of the Treasury department?*

MR. BROWN: Ten years is the recommended period and has been approved by state commissions and is acceptable to the Treasury department. Shorter periods will not be allowed for tax purposes as far as the Treasury department is concerned.





Natural Gas Fuels Diesel Engine To Feed City's Power Lines

TOP OF PAGE is Nordberg Duafuel diesel engine installed at Elkhorn. At left, top, is shown parallel arrangement of American meters. At bottom, outside installation of gas regulators and surge tank.

THE purchase of a "dualfuel" diesel engine by the Elkhorn Light & Water commission of the city of Elkhorn, Wis., in 1948 was an innovation in the municipal power field. To some it may seem unusual to use natural gas as the main fuel supply with the source hundreds of miles away. Wisconsin is not generally looked upon as a field for diesel engines of the larger sizes arranged for gas burning, yet here at Elkhorn is evidence that an engine of this type has definite advantages. It is believed that this is the only gas burning diesel in service in Wisconsin.

When the power plant building was originally constructed it was the intention to install diesel generating equipment, but this plan failed to materialize. At that time the city maintained a distributing system but purchased its power requirements from a utility system. Until the present diesel was installed, the building housed the distributing switchboard, two motor-driven pumps of the city water system, a single cylinder 50-hp Fairbanks-Morse variable speed diesel belted to a centrifugal pump which served as standby, a work shop, and garage space. In 1940, a plan was again considered to install three 900-hp diesels to take over the entire city load, but this also was never carried through.

When natural gas became available in Elkhorn, consideration was given to the installation of a diesel that not only would burn gas but would also burn oil should there be times when gas was not available. This led to the purchase of a Nordberg dualfuel engine in March 1948. This engine is a four-cycle, six-cylinder supercharged unit with a 16-in. bore and 22-in. stroke and drives an 875-kw, 2400/4160-volt, 3-phase, 60-cycle Elliott generator with a 15-kw V-belt driven exciter. Being of the dualfuel type it operates as a diesel on either gas or oil fuels; the change from one to the other can be made instantly by rotating the control wheel at the end of the engine. Normally the engine burns gas, but the contract with the gas company is such that during peak load periods it may be necessary to switch to oil fuel. The plant is given about an hour's notice when a changeover is required. During the winter of 1949-50 the total time the engine was off the gas line was only 20 hours, the longest single period being six hours.

Shortly after the engine was purchased there was a change in the supervision of the plant. At that time the

By A. J. Wolff

Mr. Wolff is superintendent, municipal power plant, Elkhorn, Wis.

TABLE 1. Costs of Gas Generated Power and Purchased Power.

Month Eng. Hrs.	KW-Hr. Generated	Gas (Cu Ft)	Cost of Gas	Pilot Fuel Oil (Gal.)	Fuel Oil (Cost)	Lube Oil (Gal)	Lube Oil (Cost)	Labor	Maintenance	KW-Hrs. Purchased	Cost of Purch. Power	Month Eng. Hrs.
Jan. 363	325,940	3,214,000	$1392.40	772	$ 84.92	72	$ 38.88	$410.00		429,600	$5370.00	Jan. 363
Feb. 391	344,600	3,465,000	1463.70	903	99.33	72	38.88	410.00	$40.00	439,200	5270.40	Feb. 391
March 392	345,442	3,207,000	1390.30	2,751	302.61	91	49.14	410.00		360,000	4608.00	March 392
April 391	328,940	3,375,000	1394.80	929	102.19	80	43.20	410.00		355,200	4511.04	April 391
1537	**1,354,922**	**13,261,000**	**$5741.20**	**5,355**	**$589.05**	**315**	**$170.10**	**$1,640.00**	**$40.00**	**1,584,000**	**$19,759.44**	**1537**

Summary:

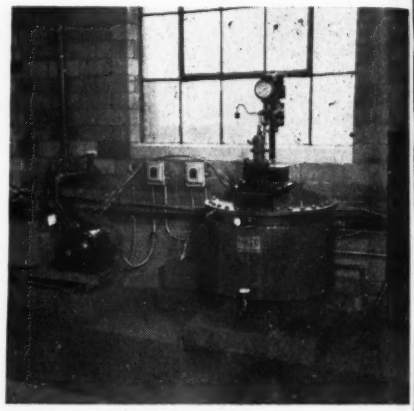
Total kwh generated	1,354,922	Total kwh purchased	1,584,000
Total cost generated power	$ 8180.35	Total cost purchased power	$19,759.44
Cost per kwh generated	$ 0.00603	Cost per kwh purchased	$ 0.0125

generator, which had already been delivered, was sitting outside the plant, while the engine stood on a railroad siding waiting to be unloaded. Some work had been started on the foundation. No complete plant layout had been made, no auxiliaries had been ordered; in fact the whole project was at a standstill. After all the loose ends had been taken care of and difficulties and delays in securing materials and services had been solved, the installation was finally completed and the engine placed in service late in July 1949.

Since the engine did not have sufficient capacity to carry the entire city load, it was intended to operate it in parallel with the Wisconsin Gas & Electric Co. system. This would accomplish two purposes. One, it would smooth out the peaks of the city service, thereby lowering the demand charge and reducing the overall rate of purchased power. Two, it would provide some standby service in case of a failure of high line service. The engine is held at practically full load capacity with unit power factor from 7 a.m. to 10 p.m. six days a week. During this period, only the demand in excess of the load carried on the engine is supplied by the utility system which also carries all the city load when the engine is not in service.

Table 1, covering the first four months of 1950, shows the comparative costs of gas burning diesel-generated power with purchased power. Since the engine operates on constant load, there is little difference from month to month of the various expense items that enter into the cost of generation.

The figures show that the engine is delivering 1 kw-hour for each 9.77 cu ft of natural gas, and has a lube oil consumption of 1 gal per 4301 kw-hours. Including cost items of gas, pilot and fuel oil, lube oil, labor, and maintenance, the kw-hour cost is .603 cents as compared with 1.25 cents for purchased power. During this period, the only expense for maintenance was the renewal of filter elements of the oil purifier, which are replaced periodically. During these four months, the engine operated for a total of 1537 hours, which, with the 1,354,922 kw-hours generated, shows the engine was carrying an average load of 881 kw. This means that the engine was slightly beyond its full load rating of 875 kw.



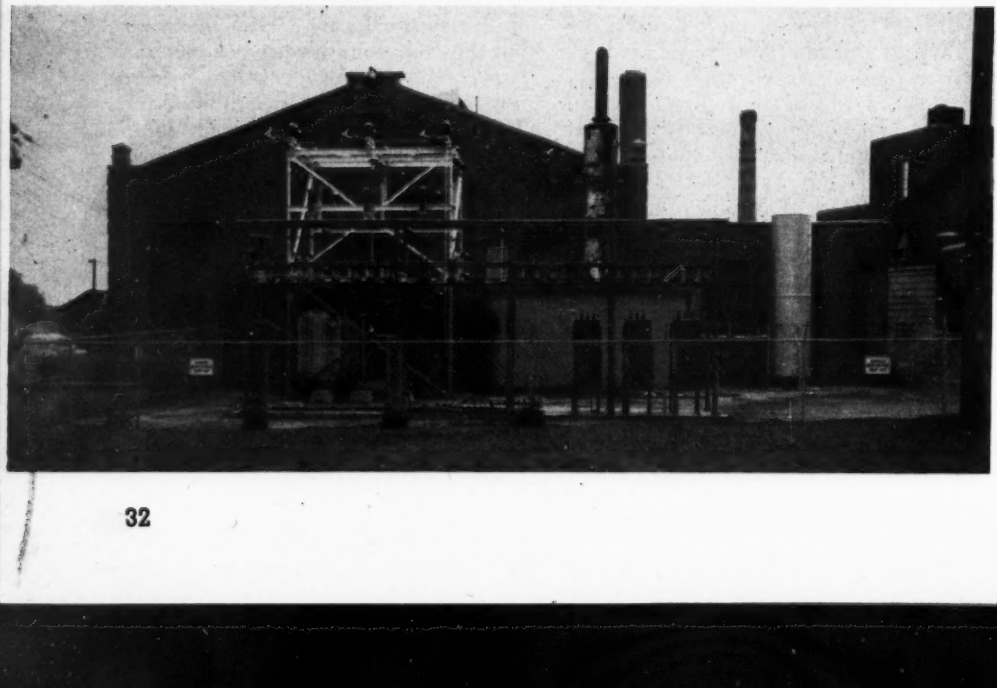
POSITIONS of oil purifier and starting air compressor inside plant.

It will be noted that, for the month of March, the amount of pilot and fuel oil was much higher than for either of the other three months. This was occasioned by cold weather when the engine had to go from gas to oil fuel on several instances.

The plant is favorably located adjacent to the main of the Wisconsin Southern Gas Co. A 4-in. line carrying gas at 50-55 lb pressure goes to the gas company's regulators, where the pressure is reduced to about 14 lb. After passing through two meters arranged in parallel, the gas is again piped outside the building to a scrubber which also serves as a combined reservoir and surge tank.

Oil used for pilot fuel and for regular operation when gas is not available is delivered by tank car to a siding which runs through the rear of the plant property. There are two storage tanks having capacities of 15,300 and 27,500 gal, with unloading facilities consisting of

OUTDOOR SUBSTATION of Elkhorn Light & Water plant. Concrete structure at left of gas surge tank houses air filter; snubber is shown above this structure.



a Viking Type ZL transfer pump driven by a 3-hp Master motor.

Oil from the storage tanks flows by gravity through a Trident filter and a Trident meter, then to the built-in fuel transfer pump on the engine which delivers oil to the fuel header. There is also an overhead day tank of 300-gal capacity to which fuel can be transferred by a Roper 26F3. 3-gpm, 40-psi head pump driven by a ¼-hp General Electric motor, which is located in the pit adjacent to the engine.

With the small amount of oil fuel used as pilot fuel when the engine is burning gas, and since the engine burns oil only on rare occasions during winter, it has been found advisable to use a quality fuel oil. For this purpose, Lockwood's lubricated diesel oil, a clear, light-weight oil, is being used. While the cost is but little more than fuels normally used for an engine of this type, the advantages more than outweigh any difference in cost, especially since so little oil fuel is used. The higher cost would have little effect on the overall cost of power generation.

The cylinders are lubricated by a 12-feed Manzel force feed lubricator mounted at the control end of the engine. Bearings and other details requiring lubrication are cared for by the circulating pressure system and supplied from a built-in gear-driven pump located on the operating side of the engine adjacent to the flywheel. Oil from the various parts lubricated returns to the sump in the bedplate. The pump takes its suction from the sump and forces the oil through a Nordberg duplex strainer, then the Ross 1206-CP lube oil cooler having a capacity of 550,000 Btu per hour and then to the lube oil header on the engine for recirculation. A Hilco purifier operates continuously, taking oil from the sump; after being purified, the oil is again returned to the sump supply. This purifier has a capacity of about 2 gpm.

There is also an auxiliary lube oil pump to serve as an emergency should there be a failure of the built-in pump. It is also used as a before-and-after lubricating pump. This is a Roper rotary pump, having 130-gpm capacity at 50 psi and driven by a 10-hp General Electric motor.

One noticeable advantage in the use of gas fuel is the lack of contamination and the long life of the lubricating oil. After the engine had seen 2175 hours of operation, a sample of the oil, which is Ursa P-30, was sent back to the Texas Co. for analysis. It was found that there had been no change in the oil since the engine was placed in service other than a minor difference in viscosity, which could readily be remedied. With the method used for purification it is believed that the oil will last indefinitely.

Over a four-month operating period, the engine showed a lube oil consumption of 4301 kw-hours per gallon. While this good showing in lube oil consumption has a definite bearing on kw-hours production cost, it has a further advantage that cannot be so readily noted. This is the minimizing of wear to bearings and working parts attributed to clean oil. Lessened wear means lower maintenance expense and longer engine life.

Water for Elkhorn is obtained from deep wells, which are also the source of cooling water supply for the engine. Raw water is taken from one of the wells and is discharged into a 275-gal tank located just above the floor and back of the engine. At the outlet of this tank is a Y connector, one branch going to the lube oil cooler, the other to the Allis-Chalmers Electrifugal raw water pump, which has a 300-gpm capacity at 90-ft head and driven by a 15-hp motor. This pump discharges through a Ross 1006-CP heat exchanger which has a capacity of 1,710,000 Btu per hour. After passing through the heat exchanger, the water is carried to an old well and returned to the ground supply. All city water is treated and consequently soft water is available for the engine jackets. This water is circulated by an Allis-Chalmers Electrifugal pump of 300-gpm capacity at 70-ft head and driven by a 10-hp motor. In this circuit is an overhead surge tank of 50-gal capacity.

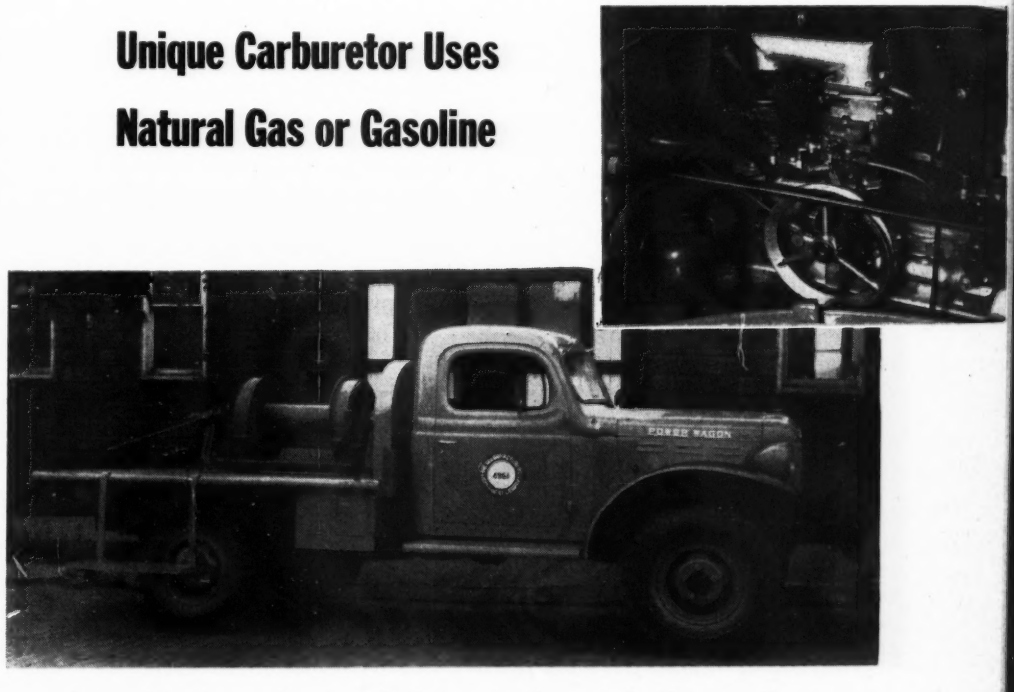
The plant at Elkhorn is exceptionally quiet in operation due to effective silencing. A concrete structure houses the American type 5-OCH air filter on the suction line, while a Burgess-Manning type STL-16 snubber quiets the exhaust. On the exhaust line is a Zallea flexible connector to care for expansion.

A panel on the operating end of the engine has the push button controls for the auxiliaries and a Viking alarm for lube oil and jacket water pressures and temperatures. This alarm functions if the oil or water pressures drop below 15 psi and the temperature of either rises above 150°F.

Air for starting is supplied by an 11-cfm, 250-psi Gardner-Denver air compressor with 5-hp motor.

While the diesel engine generates less than half of the city's requirements, the savings being made definitely prove that the installation is a good investment and that greater savings would be possible if the entire city load could be carried by diesels.

Unique Carburetor Uses Natural Gas or Gasoline



A combination carburetor which permits the use of either gasoline or natural gas as a fuel is the unique feature of a power wagon recently placed in service by the Pittsburgh Group of the Columbia Gas System at its Washington, Pa. office.

A Dodge truck equipped with four-wheel drive for heavy going, the unit is used for well work. The bed carries a reel for bailing wells. While working at the well, the truck's fuel intake may be connected to a natural gas source, thus taking advantage of a convenient and plentiful fuel supply. The control wheel is of the same type as that used on a derrick floor to control gas well-drilling operations.

The Economics of Metering

Part 1 of a 2-Part Article

In the interests of periodic re-evaluation of meter repair, maintenance, and retirement practices, Mr. Bachmann, distribution engineer for Public Service Electric & Gas Co., Newark, N. J., herein reviews important studies that have been made in the field of metering economics, amplifying them with a discussion of a method of determining age-maintenance relationships developed by his company.

Mr. Bachmann's study, delivered in a talk before the AGA convention in Atlantic City in October, looks at the broad field of the overall cost of metering. Five points are covered: (1) Losses in revenue of inaccurate meters, (2) Fixed charges and investment in meters—interest and taxes, (3) Changing of meters for test and repair, (4) Replacement cost of condemned meters, and (5) Testing and repairing meters—or study of maintenance with age. These five divisions are based on the breakdown in the "standard chart of metering costs" (Fig. 1), developed by the AGA meter committee more than a dozen years ago.

In this first of two parts, Mr. Bachmann touches on all five points, detailing two methods of making maintenance-meter age studies. Next month's installment outlines a third, newer method used by his company, tells about a program for lowering costs, and presents a formula for determining whether it might not be more practicable to simply discard a meter rather than repair it.

By G. K. Bachmann

Revenue Losses—Inaccurate Meters

IN the standard chart *(Fig. 1)* the falling off of correct meters with age is assumed to mean that these meters have turned slow.

Whether this is so or not is a determination to be made locally. In the national picture, in my *opinion*, and in my company, this point appears to be a weak one today. I have listened to meter committee discussions over many years and it appears that the fast meter is one of our problems. With the advent of cleaner gas or mixed and natural gas a larger proportion of fast meters has appeared on the scene, while years ago conditions of dirty gas made the slow, worn meter a predominant problem. The slow meter brings us a mixed blessing. It does counteract to a certain extent the taint of having fast meters. (Of course commercially correct meters are the best means of maintaining good customer relations). In an analysis of metering costs of my company which follows, I do not pursue this point of economy in regard to slow meters further, for the reasons mentioned, and because our unaccounted-for gas is little over 3%, a rather satisfactory figure.

Interest and Taxes

In recent years the following proposal has been made: Where there is a choice of rediaphragmming a meter, making a complete repair, or purchasing a new one in its place, it is advantageous at this time to make the complete repair because the cost is an operating expense deducted from profit, and the cost of this repair must be discounted 38%, the amount of federal corporation profits tax that would have been paid on additional profit if the new meter had been purchased as a capital item instead.

In the analysis of this comment, three things stand out:

1. There are no signs of reduction of the 38% corporation tax.

2. Eventually the new meter purchase price is amortized, and also becomes an operating expense deductible from profit, the federal tax on which profit is reduced by 38% of the cost of the new meter as a result of the purchase.

3. No one is happy when a presently realizable profit is not declared, neither the utility investor nor the income tax man. For every 38 cents not collected by the income tax bureau, the utility investor foregoes 62 cents in profit.

The only thing that can be said for rediaphragmming because of the conditions mentioned is that for the time being cash on hand is conserved. In some situations this may be important, but on an overall approach to meter economics the proposal is irrelevant.

Changing Meters for Test and Repair

This problem has two main factors.

1. The cost of doing the job itself. In our company this cost has risen steeply over prewar figures — beyond rises in other activities. It is a custom job, difficult to time-study, increasingly more difficult because of automatic appliances, aggravated by changing labor relations.

2. The frequency of periodic age change. Reference to this point will be made later.

Replacement Cost of Condemned Meters

We have had a serious inflation of currency in the past 10 years. In an economic study, do we use the original cost in calculating depreciation? Or do we use the present cost of a new meter? This general question of national interest in all fields is a subject of hot and heavy argumentation by the National Assn. of Cost Accountants, Internal Revenue Bureau, and others, particularly for purposes of income statements. There is little agreement among the experts. We are not being realistic when writing off a $6 meter into our depreciation reserve, while at the same time we should accumulate funds available for a replacement purchase of a $13.75 item.

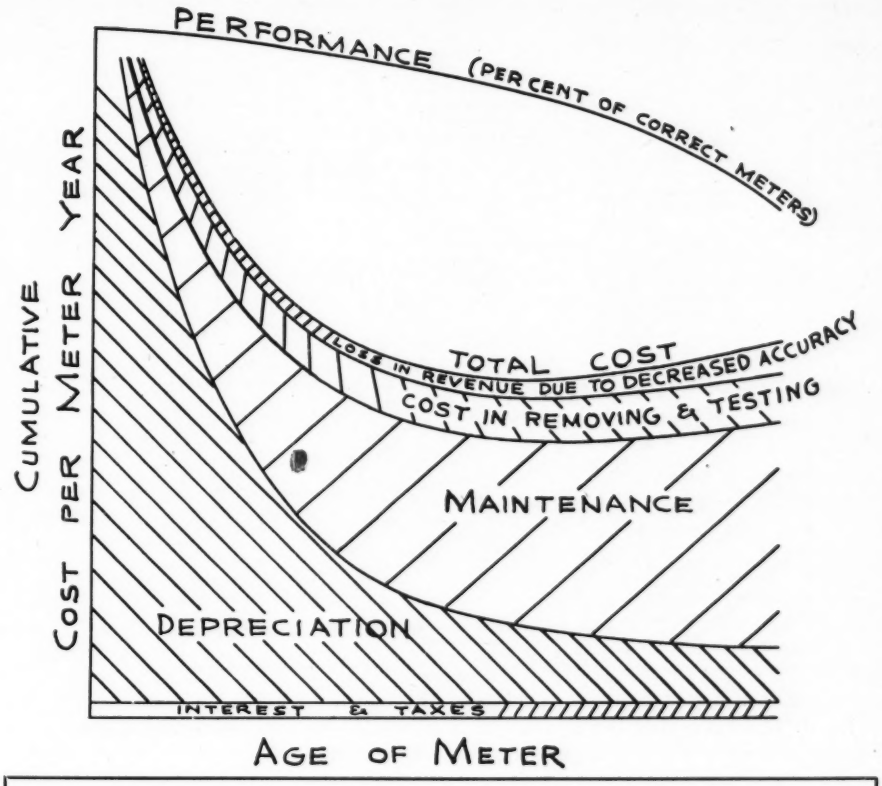
My recommendation is to leave the inflation out of it, by recognizing that the meter purchased 25 years ago is basically the same as one bought today in material and manpower. For purposes of a cost study, base the depreciation curve on the cost of today's meter.

Study of Maintenance With Age

This is the most difficult problem in regard to detail. Before it is considered, comments are in order on repair shop cost accounting, on which the maintenance study is partly based.

Repair Shop Cost Accounting. In the 1927 AGA Proceedings, Accounting Section, is a 23-page dissertation on "Meter Shop Practice—Cost Accounting Practice," by G. A. Lane of Chicago & A. Di Carlo of New York City. This is a highly detailed study of meter repair costs giving all the ramifications of cost accounting. Procedures for monthly inventory of work in process in the repair shop, with dollar values for all operations for all size meters,

Fig. 1. At right is standard chart of metering costs, showing trends in five cost categories based on meter age.



are worked out for keeping of accurate repair costs.

For those requiring a simplified method of arriving at meter repair costs, the factor system is well described in the meter committee reports of 1937. This method uses pre-established ratios between sizes and types of meter repairs to arrive at a repair cost. See *Table 1.*

What is new in the field of repair shop cost accounting? Two points stand out.

1. There is benefit to be derived from using a "standard" cost for a unit of repair in the factor table. By studying efficient operation for any one of the types of repair shown in the factor table, we may arrive at a standard cost for each unit of repair. Consequently, at the end of the month not only will the factor table allow us to deduce the repair cost of various types and sizes of meter, but the result compared to the standard cost will allow us to compute the efficiency of operation. For instance, if our standard 5 lt. O. K. cost is determined to be 0.75, our computed cost for the month is $1, our efficiency that month is $\frac{.75}{1.00} = 75\%$

The shop superintendent should seek out the variances from standard costs. The use of performance standards is becoming common today among manufacturers as a tool for controlling costs, and we should benefit from this device.

2. Non-payroll costs of labor must be reckoned with. This includes such things as social security and unemployment taxes, welfare department benefits, contributions to group insurance, pensions, recreational benefits, etc. In the Public Service gas department these costs total nearly $1 million on a payroll of $20 million, about 5%. Government studies are available on this subject, and these show higher percentages for utilities, about 12%. The difference arises because illness, holidays, vacations, are included in some studies and not in others. Whatever the figure may be it is too large to be ignored. When we buy new meters, the manufacturer must retrieve these items for his employees from the purchase price, so for a true comparison these non-payroll costs must be included in repairs. (See *Table 2.*)

Analysis of Maintenance Costs. To return now to the maintenance-meter age study: there are two methods of procedure that appear in the literature. The first method, which I will call the genealogy or history method, appears in a study by D. P. Allen, Washington Gas Light Co., 1938, "Economics of Metering."[1] I call it the genealogy or history method because the charted study resembles a family tree in some respects. See *Fig. 2.*

This chart of consecutive repairs is made up by recording a year's repairs (or those for a very large group of meters to constitute a very large sample) and classifying this repair against the

[1]Copies available from AGA headquarters.

TABLE 1. Factor Table for Computing Meter Repair Costs

Size	O. K.	Adjust	Part.	Gen.	Dia.
5/1t.	1	1.9	3.8	5.3	8.2
10 A.	1.2	2.0	4.7	6.5	10.1
20 A.	1.8	4.0	7.5	10.7	17.4
30 A.	2.0	5.0	8.7	14.3	21.8
60 A.	4.0	10.0	15.9	23.3	41.2
150 A.	5.0	15.0	25.6	37.8	83.3
Emco No. 4	4.0	10.0	25.6	36.7	72.2
Emco No. 4½	5.0	10.0	25.6	54.4	95.6
Emco No. 5 Metric 500	5.0	12.0	31.1	61.1	113.3

1. Multiply factor x number of each repair.
2. Divide weighted units into total charges to obtain unit cost (5 lt O. K.).
3. Multiply unit by appropriate ratio from factor table to obtain any repair cost for any size meter.

TABLE 2. Maintenance Cost Table[1]

Repair and Change Costs—5 Lt Meters

Repair	Repair Labor	Mat.	Gen. Chgs. Admin.[2]	Total Repairs	Meter Change Cost		5% Non-Payroll Lab. Cost	Grand Total
					Labor	Misc.		
Test	.75	.10	.15	1.00	1.00	1.00	0.09	3.09
Adjust	1.50	.20	.20	1.90	1.00	1.00	0.13	4.03
Clean & Adjust	2.55	.80	.40	3.75	1.00	1.00	0.18	5.93
Clean & Oil	3.00	1.55	.65	5.20	1.00	1.00	0.20	7.40
Re-Dia.	4.00	3.25	.80	8.05	1.00	1.00	0.25	10.30

[1]For Essex division, Public Service Electric & Gas Co.
[2]Full administrative costs not used, as even with a new meter program some administrative cost is incurred.

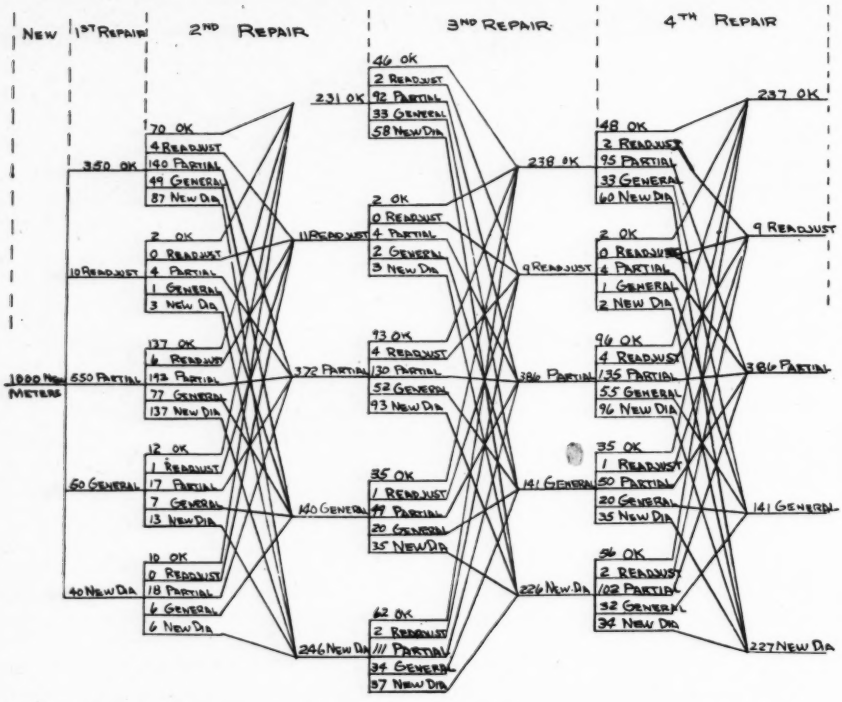


Fig. 2. Chart of consecutive repairs used in developing maintenance-meter age data.

previous repair, which in turn is classified as the 1st, 2nd, 3rd, or 4th repair since date of purchase. This method has one definite advantage; i.e., it is based on current occurrence of repairs. The disadvantage of this procedure is that almost perfect records are required, and a tremendous volume of tabulating is carried out. D. P. Allen remarks that the job is difficult and requires shading of results based on judgment. The results of this study, combined with repair and change costs and another study, "Average Service Period Based on Meter Age," are used to develop the "maintenance—meter age" data.

Another method of arriving at a maintenance — age determination is given in a valuable paper, "Some Thoughts on Meter Economics" by A. W. Johnston, then of Hartford, Conn., before the Pennsylvania Gas Assn. in 1941. Here again, by means of satisfactory records, all tabulated by year of purchase of the meter, it is possible to state just what repairs would in general be made to meters in various service-life categories. This information is based on current conditions, as it is gathered from data of the last complete age change of all meters. See *Table 3.*

An advantage of this method is that the information may be gleaned from records of all meters in service, and not from a sample lot.

Application of either of the two methods given is not possible in the gas department of PSE&G. Meter history cards based on purchase data are a facility not available. In this respect our company is not alone. How then should our company or a company having similar records conduct a maintenance cost study? I wish to present to you a third method of arriving at this goal that is both quick and not too burdensome, and the results we obtained.

(This third method will be detailed in the concluding installment next month.)

TABLE 3. Maintenance—Age Determination

Average Service Life of Meter	45 Yrs.		28 Yrs.		28 Yrs.		19 Yrs.	
Trips to shop during life	(10) 5 Y.C.P.		(6) 5 Y.C.P.		(6) 5 Y.C.P.		(4) 5 Y.C.P.	
Repairs								
Re-diaphragm	@$4.50	(2) $9.00	(1)	$4.50				
Clean and Oil	3.50	(1) 3.50	(1)	3.50				
Grind valve	2.50	(3) 7.50						
Adjust	1.25	(1) 1.25	(1)	1.25	(2)	$2.50	(1)	$1.25
O. K.	.75	(2) 1.50	(2)	1.50	(2)	1.50	(2)	1.50
Condemn	.25	(1) .25	(1)	.25	(1)	.25	(1)	.25
Maintenance during life		$23.00		$11.00		$8.75		$3.00

Cyclata

By ORLO B. HOLMAN

IN the fall of 1948, after the arrival of substantial amounts of natural gas into the Philadelphia Gas Works Co. Stations, United Engineers & Constructors Inc., in collaboration with The United Gas Improvement Co., began experimental work on the cyclic catalytic reforming process. The equipment used was a laboratory carbureted water gas set at Station "A." The set has an internal diameter of one foot. Using various types of catalyst and various temperatures, the results of the process were so promising, it was decided to try a commercial adaptation.

It was thought that this process could be applied to a normal carbureted water gas set, using all of the portions of the set that were adaptable and then adding just the additional equipment that was needed. The set chosen for conversion was No. 16 at Station "A" which is also equipped so that the gas made and the materials used can be measured separately. This set has an 11-ft outside diameter generator, carburetor, and superheater.

Superheater Process

The process is carried out in the superheater only, the generator and carburetor not being used. The changes made to the set, to apply the process, consisted of blanking off the superheater from the carburetor and installing in the superheater a combustion chamber, preheat bed, and catalyst bed. A diagrammatic sketch of the set is shown in *Fig. 1.* The process gas mixture and heating gas mixture are introduced into the combustion chamber at the bottom and flow upward. The blast gases pass through a waste heat boiler and the make gas passes through the washbox into the gas train. With appropriate piping changes, both the make and blow gases could be put through

Mr. Holman, Philadelphia Gas Works Co., originally presented his paper at the 1950 annual meeting of the Pennsylvania Gas Assn., Philadelphia.

Catalytic Reforming

How Philadelphia Gas Works reforms natural gas in a carburetted water gas set

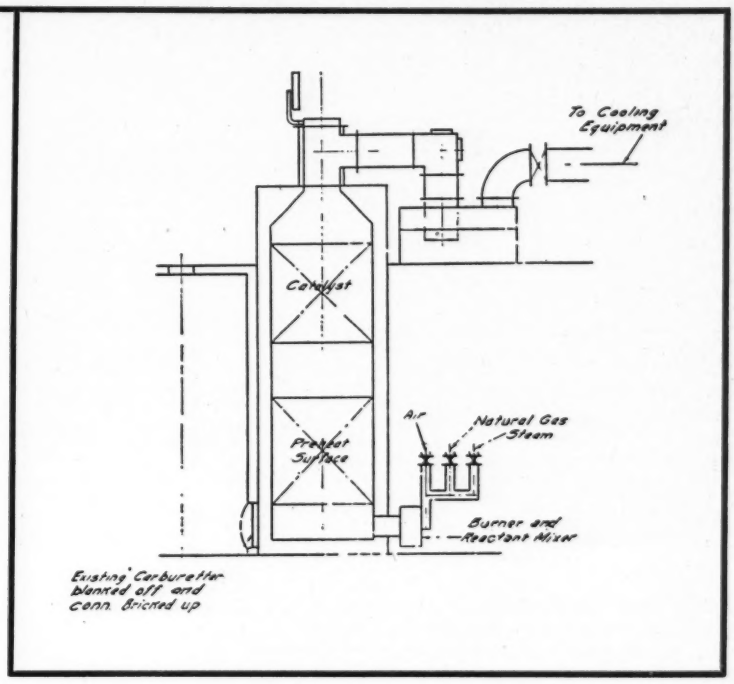


Fig. 1. Diagrammatic sketch of the carburetted water gas set used. Changes made to the set included blanking off the superheater from the carburetor, and installing a combustion chamber, preheat bed, and catalyst bed in the superheater.

the waste heat boiler and relatively larger amounts of steam could be generated.

Air is received from the regular generator house blast main header; steam and natural gas from the plant systems. The valves are operated with the usual hydraulic pressure system, controlled by the usual automatic control machine. The entire operation is automatic and closely parallels normal water gas set operation, with of course, no handling of coke and oil.

No Specialists

Operating engineers from United Engineers & Constructors Inc., started the set. After a two-month period of experimentation and instruction, the operation was turned over to The Philadelphia Gas Works Co. and we have been operating it ever since. The set requires no specially trained operators. One of the regular gasmakers from each shift operates the set. His duties consist of reading and recording the data from the gauges and occasionally making operating adjustments. The work is more simple than that required for operating other sets. One man could probably operate at least two sets.

The gas made on the set is being mixed with the station's sendout and is completely interchangeable. Last summer during low output periods, a mixture of coke oven gas, cyclic catalytic reforming gas, and modified natural gas made up the output. The gas, under conditions such as this, has to be high in inerts to offset the high hydrogen coke oven gas. The hydrogen to inerts ratio was 0.45. Under other conditions, a gas that was about one half hydrogen was made. So, it is clearly indicated that the quality of the gas can be varied to meet any condition. Gas analysis and results are shown in *Table I*.

To date, the shut down time on the machine amounts to less than 1% of the running time. This, I think, is very good considering the fact that this is the first machine of this type and a certain amount of changing and experimentation is necessary.

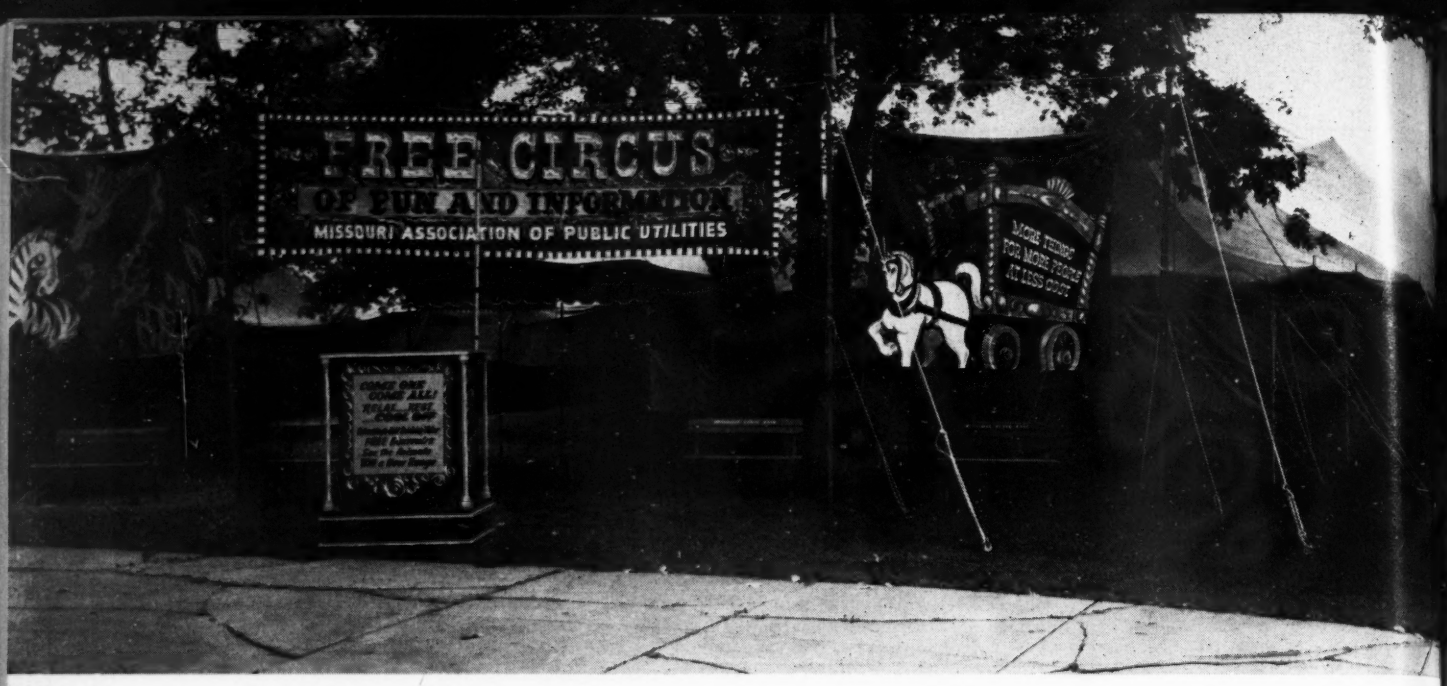
TABLE I: CYCLIC CATALYTIC REFORMING SET NO. 16

Analysis	Hi-inerts	Medium-inerts	Low-inerts
Ill.	0.0	0.3	0.5
CO	8.4	12.3	14.4
H_2	27.9	37.7	47.0
CO_2	7.0	5.1	3.8
CH_4	7.4	12.6	15.2
C_2H_6	0.1	1.1	1.2
O_2	0.9	0.5	0.3
N_2	48.0	30.4	17.6
H_2/Inerts Ratio	0.51	1.06	2.20
BTU	183	302	381
Sp. Grav.	0.713	0.613	0.488
Nat. Gas/Mcf	217	373	500
Nat. Gas/Mcf Enriched to 530 Btu	538	567	616
Steam/Mcf of Make	10.0	17.0	20.8
Make/day	12,321	7,535	5,927
Make/day Enriched to 530 Btu	20,883	10,920	7,697

Cost Comparisons

Recent cost comparisons between fuel bed reforming and catalytic reforming, including all factors, such as demand charge on the natural gas and estimated replacement of catalyst, show a differential of 3½-4 cents per Mcf in favor of catalytic reforming. This is on a 530-Btu basis, with a comparable quality of gas made under each type. The essential factor, in our judgment, that makes catalytic reforming attractive is this economy of operation, and, as of now, as a result of it and our experience to date, we are thinking in terms of substantial expansion of cyclic catalytic reforming.

There are other collateral factors favorable to cyclic catalytic reforming, including relatively low capital cost and such factors as nitric oxide in the make gas of only about 1 gram per million cu ft and naphthalene of only about 1 grain per hundred cubic feet, and no evidence of lampblack. In addition, as long as the natural gas has a low organic sulphur content, the hydrogen sulphide yield is about one half a grain per hundred cu ft.

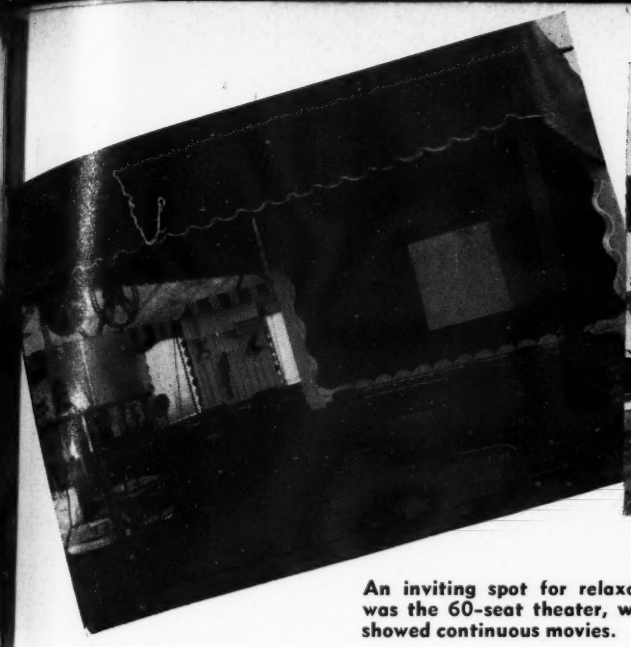


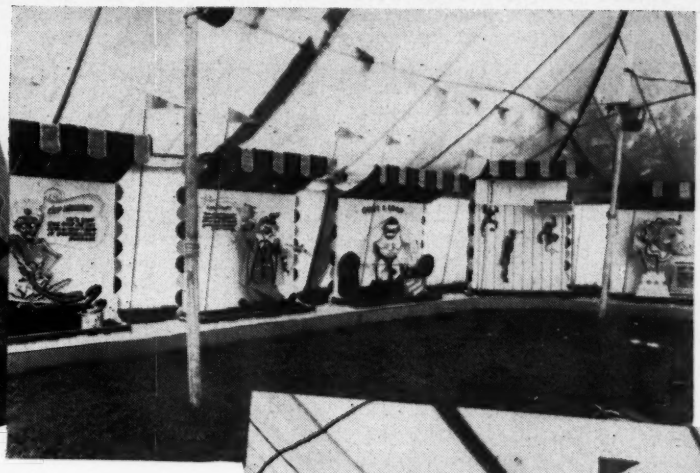
First state fair exhibit ever attempted by Missouri utilities was housed in this 60 x 90-ft tent, located on the main midway opposite the fairground.

FREE

Missouri utilities group uses Big Tent to plump for private ownership in state fair display

A few of the 104,000 who visited the tent jam around the game wheel at right. Under each number was a message, plugging the free enterprise theme. After this event, many fairgoers were happy to seek rest in the lounges provided. Professional barker is shown at the microphone. In photo above, game wheel is shown sans patrons.





An inviting spot for relaxation was the 60-seat theater, which showed continuous movies.

CIRCUS

"Take a long look," advises the giraffe in bottom photo, explaining the difference between rural cooperatives, which private utilities welcome, and "super electric co-ops," which don't "extend electric service to a single customer." "Horse Sense" is the horse's legend, who says the $40 million to be spent by super-co-ops won't extend service to a single additional farm. "It's a good act" is the way the dog act is described, meaning the best and cheapest way to supply service is for co-ops and utilities to work together. "Skill counts," says the seal, whose balancing act illustrates the way in which business managements keep their budgets balanced.

In "Animal Show" above, the Hindu warns his audience to "Keep watching" the socialistic trends of government bureaus, while the clown's "happy thought" is the Charles F. Kettering quotation, "One of the things we have to be thankful for is that we don't get as much government as we pay for." It's "quite a load" the strong man is lifting—meaning the $32 million in taxes Missouri utilities paid last year. "It's monkey business," say the three monkeys, speaking of federal power's "unfair discrimination" against the millions who pay their bills to private utilities. "Don't forget" that thousands of people own private utilities, is the elephant's message.

A UNIQUE—and eminently successful—way to put across the old story of private vs. state ownership of utilities was cooked up last summer by members of the Missouri Assn. of Public Utilities.

They put on a circus.

Complete with professional barkers, and mechanical animals, plus a game of chance that guaranteed a winner, and a continuous showing of movies, the association's midway tent attracted 104,000 people at the Missouri state fair in Sedalia, Aug. 20 to 27.

And those that saw it liked it, judging from the many complimentary letters and oral kudos that have been received.

A principal attraction and most effective medium for telling the association's story was the line-up of 10 animals and circus characters, each representing an animated argument in favor of private enterprise. The message each represented was transmitted through a placard, as shown in the photos.

From the animal display, fairgoer's moved on to the free game, for which the prize offered was a gas or electric range—winner take his choice. All those picking the correct number on the big circular board qualified to answer this question:

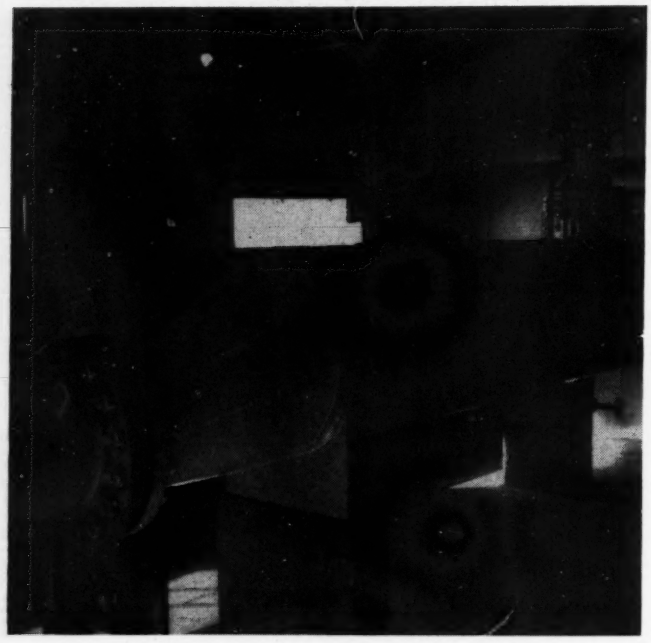
"How much taxes do you think the investor-owned gas, electric, and water utilities paid in 1949?"

The closest guess won the range. Each guesser was reminded that he could find the approximate figure on one of the exhibits in the tent, and was permitted to have another look.

A consolation prize — a yardstick bearing the legend "A full yardstick should be used in comparing utility rates" on one side and "Business-managed Missouri utilities get no government subsidies . . . but pay millions in taxes for support of schools and government" on the other—was given to every participant in the game of chance.

Near the main entrance an 8-ft square shadow-box poster listed the names of the 27 members of the association.

Originator of the circus idea was Ray Ratliff, Kansas City district advertising manager for the Gas Service Co., who served on the arrangements committee under F. M. Rosenkrans, along with other advertising men. James C. Griffin, Missouri Public Service Co., Warrensburg, was in general charge.



Two installed vaporizers have 3600-gal. capacity each.

Boiler at left, two portable compressors at right.

On the Outskirts of Town

Lincoln Utility Finds City Gate Peak Shave Plant Advantageous

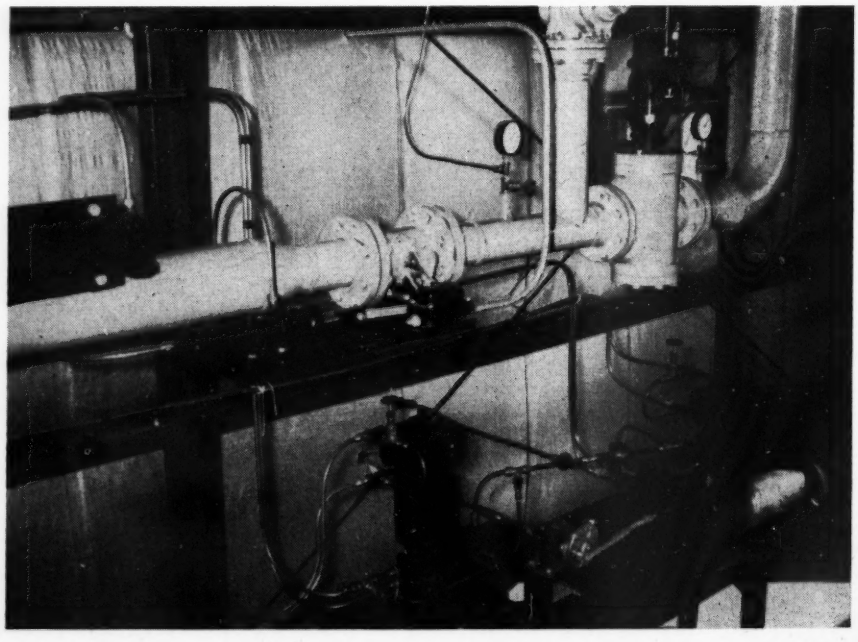
By M. G. COOK

OF unusual interest in peak shaving plant installations, the second plant installed by the Central Electric & Gas Co. of Lincoln, Neb., offers innovations which contribute greatly to ease of operation.

As a result of the decision on additional quantity of peak shaving gas, the Btu value effect on the distribution system, and the ease of operating this type of system, the company located its second plant several miles out of town on the main line downstream from the town border station. In locating a plant in this manner it was decided that 1000-Btu gas could be made and mixed into the main line up to 25% of the volume of natural gas used, and no distribution difficulties would be encountered. Of course, locating a plant on a main ahead of a town loop posed some problems as to utility facilities. Light and power lines and water mains were some distance away.

The ground on which the plant was built is located adjacent to the main line of a railroad and is large enough in area to accommodate 20 additional 30,000-gal tanks. Approximately 500 ft of line was laid to connect the peak shaving plant with the natural gas main. The plant consists of two unloading stations, twelve 30,000-gal. gross capacity tanks, vaporizing and mixing equipment sufficient to produce 5.2 MMcf of 1350-Btu propane-air per day, plus of course the necessary control equipment.

The 12 tanks are arranged in two batteries of six each, and manifolded so that additional tanks may be added on at any time. The vaporizing equipment consists of two 3600-gph capacity reboiler type exchangers. The mixing equipment is Askania with Cutler-

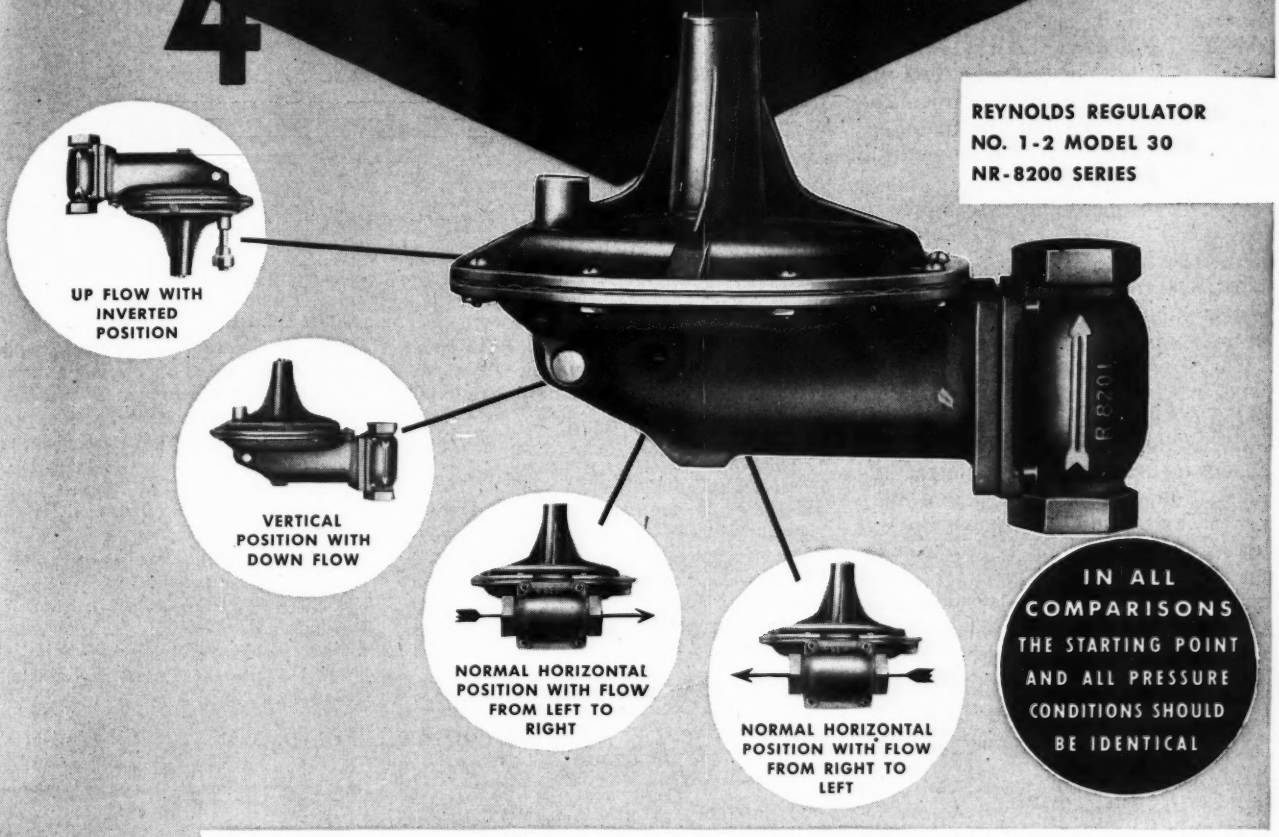


Complete propane-air mixing station. Capacity, 5 MMcf per day.

Mr. Cook is an engineer, Phillips Petroleum Co., Bartlesville, Okla.

WHY NOT BUY A REGULATOR SPECIFICALLY DEVELOPED AND ORIGINATED BY *Reynolds* FOR USE IN CONVERSION AREAS WHEN CHANGING FROM LOW TO INTERMEDIATE PRESSURES?

4


REYNOLDS REGULATOR
NO. 1-2 MODEL 30
NR-8200 SERIES
UP FLOW WITH INVERTED POSITION
VERTICAL POSITION WITH DOWN FLOW
NORMAL HORIZONTAL POSITION WITH FLOW FROM LEFT TO RIGHT
NORMAL HORIZONTAL POSITION WITH FLOW FROM RIGHT TO LEFT
IN ALL COMPARISONS THE STARTING POINT AND ALL PRESSURE CONDITIONS SHOULD BE IDENTICAL

Reynolds Engineering Department has available a large variety of charts showing performance under specific operating conditions. On request, individual tests will be made for any company covering their special problems.

8200 Series Regulators are quickly installed in existing house piping • May be installed in any position on a 90° setting • Orifice can be changed at any time • Only an Allen wrench is needed to inspect orifice or valve pocket.

GAS CONTROL SINCE 1892

REYNOLDS GAS REGULATOR CO.

ANDERSON, INDIANA, U. S. A.

Hammer thermeter control. Air is supplied by four Ingersoll-Rand portable diesel engine-driven compressors which have a capacity of 600 cfm each at 75 psig. The compressors are intercooled but the engine and intercoolers have their own radiator systems. By using anti-freeze in the radiators, it was unnecessary to drill a well to provide circulating water.

The compressors, being of the portable type, do not require special foundations or auxiliary equipment. They are complete units in themselves and it is necessary only to connect the air discharge lines to a header to put them in service. These advantages are considered great compared to permanent installations. Should the occasion arise when additional air capacity would be required, it would be necessary only to add more units. With all four operating simultaneously through one manifold, no surging effects have been noticed.

Steam is supplied by one 150-hp packaged steam boiler. The boiler is kept warm by the use of a small auxiliary water heater that is operated continuously throughout the winter months. This is an advantage since the water in the boiler is kept from freezing and is warm enough to permit putting the plant into operation at a moment's notice. Of course, the installation of a boiler of this type means that no foundations or brick work are required and installation charges are kept at a minimum. Throughout the winter there was adequate warmth in the buildings without running the large boiler. Of course, when the plant is in operation, the equipment gives off enough heat to keep the temperature within the buildings comfortable for operating personnel.

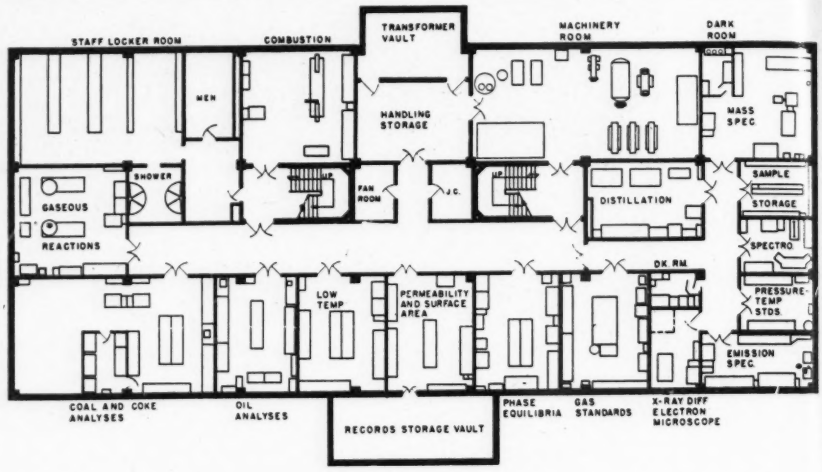
In operation the output of the plant is geared to the compressors. The speed of the compressors is set according to the amount of air required and the number of units operating is dependent upon the volume of gas required. They are not operated by feathering or loading, but are either all on or all off. Various combinations are used to give the required amount of air.

Propane and air in the mixing station are mixed in a large pipe with each entering tangentially. The swirling motion mixes the gases before introduction into the natural gas main. By keeping the Btu the same as that of natural, no Btu are given to the consumer during the period the plant is operated. Should a different Btu-value gas be required, however, a simple adjustment on the thermeter raises or lowers the amount of propane used.

The vaporization of propane is conventional, and the pressure is controlled by a Fisher "Wizard" regulator ahead of the Askania control valve.

The plant operated very satisfactorily when required this winter with a minimum of supervision, and has proven the advisability of introducing peak shaving gas into the natural gas line before entering the distribution system.

The design engineers were Harold Stanton and L. Dade of Central Electric & Gas Co., Lincoln.



More students, more research

Gas Institute in New Headquarters

MORE rapid progress in research and a highly skilled body of trained technical personnel for the gas industry will be afforded in the new quarters of the Institute of Gas Technology, on the campus of the Illinois Institute of Technology (Chicago) now being occupied.

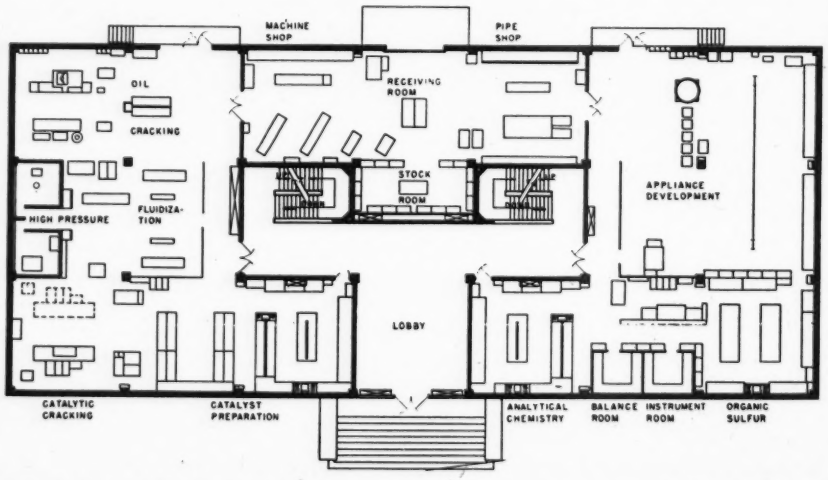
Expanded facilities for both experimentation and education of the institute's student body are housed in the half-million-dollar building. Within its 170 x 74-ft dimensions are two stories and a basement which hold the latest and finest in testing equipment. The effective working space, however, is considerably larger, as pilot plant units will be maintained at the Crawford station of Peoples Gas Light & Coke Co., where they were first installed in 1948 when it became evident that the total area requirements for all the institute's activities would require more funds than would be available.

Additional endowments for equipment are still needed, nonetheless.

On this page are shown plan drawings of the basement (above) and first floor (below), where most of the research activities are centered. The second floor, a full story, is devoted largely to administrative and educational activities; included are the director's office, conference room, reception room, library, three classrooms with movable walls which permit them to be combined into one large room for auditorium use, a library and reading room, bindery, and staff offices.

Current enrollment at the institute is 31, highest in history. Plans call for a 40-man student body by September 1952. The newest class, numbering 15, was chosen from 250 applicants.

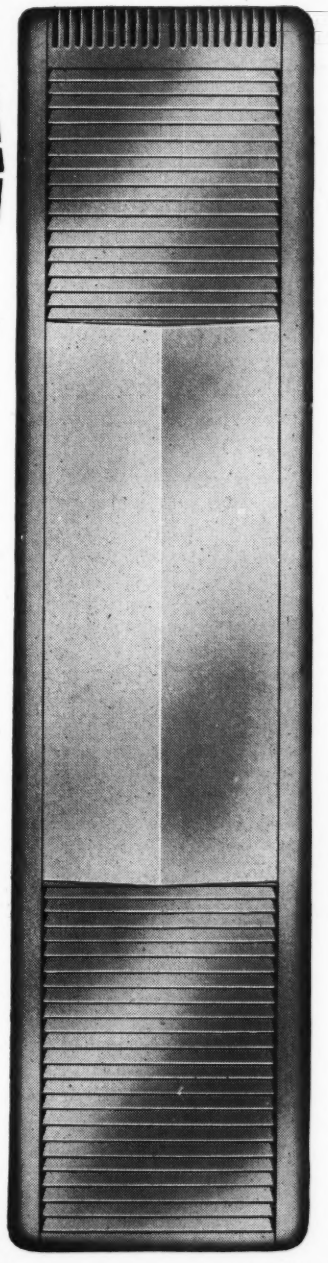
Dedication of the facilities was made at the ninth annual meeting Nov. 2. Frank C. Smith, president of Houston Natural Gas Corp. and utility leader in promoting the school, spoke.



NEW

EMPIRE

RECESSED HEATING SYSTEM



Modern Low Cost Heating Offers New Prospects for Dealer Profits!

Here's your answer to the consumer demand for an efficient method of low cost heating . . . EMPIRE RECESSED HEATING SYSTEM.

This ***high quality,*** completely new innovation in heating gives ***clean, dependable, zone-controlled heat*** at an amazingly ***low initial cost . . . Low operating cost.***

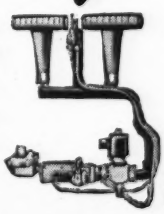
It's ***easy installation*** on standard 16 inch studs, means added savings for you, with ***service calls at a minimum*** and, few, if any call-backs.

Write today for full information, and prepare for a big year of . . . ***increased sales . . . greater profits*** with EMPIRE RECESSED HEATING SYSTEM.

DESIGNED TO MEET NEW 1951 REQUIREMENTS

Thriftmatic

New "T" type Thriftmatic burner designed exclusively for EMPIRE RECESSED HEATING SYSTEM. Burns any type of gas . . . natural, manufacture, liquified petroleum.



Gas BURNER

EMPIRE STOVE CO. BELLEVILLE, ILLINOIS

MANUFACTURERS OF GAS COOKING & HEATING APPLIANCES

Mississippi's Management IS Sold On the Value of Corrosion Control

By R. B. WILSON

The frustration that corrosion engineers have long felt in the face of apparent apathy toward their favorite topic on the part of many company executives is well documented. Two examples: in the February 1949 issue of GAS, the inter-association correlating committee on cathodic protection published a plea to management to consider the tremendous operational and cost-savings potentials of corrosion control programs; currently, in the series titled "Planning a Corrosion Control Program" running in GAS (see pp. 71-72 for this month's installment), the necessity of "selling management" is a recurring theme.

In Mississippi Power & Light Co. there is no such problem. Nearly 15 years ago, management took a long, hard look at corrosion control, spent four or five years in testing it out, and now has built an extensive system that is saving the company thousands of dollars per year.

Mr. Wilson tells here how it's been done.

THIS subject of management's attitude toward a corrosion control program is basically no different from management's attitude toward any program. It must be analyzed, just as any other project, in the light of management's basic responsibilities to the investors, customers, and employees. Although conditions vary widely between companies, there are some rather basic problems that are common to all. For example, the No. 1 objective of all companies from an operating standpoint is to increase the efficiency of the plant investment and operating methods. If proper analysis indicates that a certain program will accomplish this objective, it certainly should receive favorable consideration. So it is with a corrosion control program.

As a member of a company which has had an active and successful corrosion control program in force for several years, I feel that the best presentation I can make on this subject would be an accounting of our experience—why we became interested in corrosion control, how we started our program, what it has accomplished, some of the advantages obtained, and what it has cost us. This last item, "cost," is vitally important to the management of any company, so it is only proper that management's attitude toward a proposed corrosion control program will be governed by a careful consideration of the cost and the efficiency gained.

First, why did we become interested in corrosion control? We had to. To explain this, some background information concerning our operations is in order.

Mississippi Power & Light Co., Jackson, became involved in the operation of natural gas distribution systems starting in 1929 and continuing through the early depression years when pipelines were built from the Monroe gas field in Louisiana to Atlanta, Memphis, Birmingham, and Mobile. These lines passed through territory in which our company was serving electricity. Natural gas distribution systems were built in communities adjacent to the new lines. Starting with only three cities served with manufactured gas prior to 1929, by the end of 1936, 24 cities and towns were being served with natural gas through 357 miles of 3-in. equivalent main with an investment of $3.8 million. Our gas properties have continued to expand until by the end of 1949, 47 cities and towns with nearly 60,000 customers were being served through 1028 miles of 3-in. equivalent main with an investment of $11.5 million.

These natural gas distribution systems, built largely with steel main to operate at 50-lb pressure were the source of our active interest in corrosion problems. As early as 1934, leaks began to appear in steel mains only four and five years old. At that time, extensive main inspections and soil inspections were made in a number of these relatively new systems. The inspections revealed widely prevalent, highly corrosive soils and the fact that even then some replacements were necessary. This was recognized as a serious problem in the face of our already large and rapidly increasing gas investment. Our reaction was that immediate steps should be taken to find a satisfactory and economically practical solution to this corrosion problem.

At the outset of our efforts to combat corrosion on the gas system, we had no way of stopping the existing corrosion. With the knowledge that we were faced with maintaining steel pipe systems in actively corrosive soils, our first attack on the problem was to improve our methods of coating steel pipe and to improve, by employee training, methods of handling coated pipe so that as little bare metal as possible would be exposed to soil. This was recognized as being helpful on new systems being installed but it in no way solved our problem concerning the deterioration of the older systems.

At about the same time that our corrosive conditions on the gas system were becoming apparent, some of the first experimental work and practical applications of cathodic protection were being made by a small group of corrosion engineers. We watched these experi-

The author is vice president, Mississippi Power & Light Co., Jackson. His paper was originally presented at the 1950 AGA convention, Atlantic City.

ments with interest. Even though cathodic protection was far from being an accepted corrosion control method at that time, and even though the majority of utility operators would not entertain the thought of deliberately introducing electricity into underground piping systems because of past corrosion problems with stray street railway current, we took the attitude that cathodic protection merited a trial on our system—because if it would work, it would be the answer to our most pressing corrosion problem.

In 1936 and 1937, we called in consulting engineers specializing in corrosion control and application of cathodic protection. These engineers conducted field tests on corroding mains in our Jackson system and demonstrated the effectiveness of cathodic protection by installing trial units. During the following three years, the results of the initial work on our system were studied and additional information was obtained concerning the operation of cathodic protection installations on other systems.

By early 1941, we reached the decision that cathodic protection was sufficiently effective to warrant widespread use on our gas properties. With that decision made, we again called in corrosion engineers to assist us in the design and installation of the first full-scale applications, to train our employees in the principles of cathodic protection and techniques of necessary field tests and design procedure, and to assist us in establishing a permanent corrosion control program.

Results of Cathodic Protection

Although we had been convinced that cathodic protection would work when we initiated our organized program, a few examples from our records will indicate results of the program on the use of this most useful tool. Since the effectiveness of cathodic protection is most apparent after several years operation, the performance of our older installations should be of the most interest.

In Jackson, our largest system, a 12-in. coated steel belt line installed in 1930 had developed 80 known leaks by 1941. Pipe replacements had been made and more were contemplated. In 1941, application of cathodic protection to a 1.2-mile section of this line was undertaken as the first major project of our program. Although this section contained the most actively corrosive areas along the line, no new leaks are known to have developed since protection was applied. The remaining 3.4 miles of this 12-in. line were placed under cathodic protection in 1942 and 1943. Since then only two corrosion leaks have developed and these were believed due to a pressure increase on the system causing blowouts of deep pits already existing.

THE AUTHOR is shown at far right in this AGA convention photo, with H. R. Batchelder, U. S. Bureau of Mines (left) and E. C. Brenner, vice president, Milwaukee Gas Light Co.

Also in 1941, cathodic protection was applied to the entire gas distribution system in the town of Raymond, Miss., which had been constructed the previous year with well coated steel pipe. In the subsequent nine years, there has been one known corrosion leak on this system—and that one leak was found on a service line which was accidentally unprotected. In 1947, an inspection was made of protected mains and certain services which had been insulated from the protected system. The protected mains were found entirely corrosion free while a number of the unprotected services were found to be suffering active corrosion—these services were immediately tied in to the protected system. There has been no noticeable increase in unaccounted-for gas losses on this system since it was built, even though gas deliveries have substantially increased.

In 1944, complete protection was applied to 27 miles of 8-in. main in our important Greenville-Greenwood distribution feeder, a coupled and coated line installed in 1929. Prior to application of protection, corrosion leaks were a constantly increasing problem. During the six years since application of protection, occurrence of new leaks has been reduced to a negligible point. We are no longer concerned, as we were earlier, with the possible necessity of replacing sections of this line.

In 1945, a gas distribution system was built in the town of Itta Bena, and placed under cathodic protection immediately. Leakage has not been a problem and average unaccounted-for-gas loss has shown no increase since the town was piped.

In Cleveland, Miss., a tap line of 6-in. war-surplus light-weight invasion pipe with ⅛-in. wall thickness was installed and placed under protection in 1946. There have been no leaks on this line to date even though at the same age (four years) the original steel system in Cleveland had developed leaks in thicker walled standard weight pipe.

Certain of these older installations are our guide as to whether or not cathodic protection is working and for that reason are carefully watched. With over 80 rectifier and galvanic anode installations in operation, we have yet to find a location where cathodic protection will not work.

In the large Jackson system, leakage repair work is now almost entirely confined to the old low-pressure cast iron mains, and the as yet unprotected steel mains. A negligible amount of leak repair work is required on protected mains. The value of cathodic protection has become increasingly apparent as this system grows older and has fully convinced our operating personnel that cathodic protection is completely effective as a means of retarding leak occurrence.

Growth of the Program

By the end of 1946, we had 174 miles of 3-in. equivalent steel main under protection and by July 1, 1950, nine years after the start of our program, we had cathodic protection applied to 500 miles of 3-in. equivalent steel main. This figure represents 62.5% of all the 3-in. equivalent steel main in our entire system. The entire distribution systems in ten towns are being protected. All customers' services from protected mains are normally protected as well.

In 1941, we started with one man who was trained in cathodic protection work. Progress during World War II was necessarily slow, being impeded by manpower and material shortages, but it was not suspended. Our present organization for corrosion control is headed by the cathodic protection supervisor in the gas engineering section of the general office. He has three full-time assistants and part time clerical assistance for maintenance of records.

The supervisor is responsible for the general administration of the entire corrosion control program and renders direct assistance to the operating divisions of the company, where required, in the design of cathodic protection applications and in the supervision of installations. He also is concerned with standardization of material and its procurement, with maintenance of suitable construction and operation specifications concerning cathodic protection and corrosion control, and with maintenance of performance records for protection installations. Although their prime responsibility is cathodic protection, these men are also utilized at present for cer-

tain other activities such as assisting in the supervision of larger construction programs and leakage surveys. This work is allied with the corrosion control program but time spent on it is not charged against cathodic protection.

In addition to the general office personnel described above, it is our plan to have corrosion engineers in the larger operating divisions. This has been accomplished in one division and is shortly to be placed in effect in another. These division corrosion engineers are responsible to their respective division managers and are provided with all necessary instruments and equipment for independent operation. They are, however, subject to technical supervision by the general office corrosion personnel who may be called upon at any time for technical assistance.

In order that cathodic protection testing, design, and maintenance procedures will be uniform throughout the company, detailed engineering data and instructions have been compiled and distributed. This material is prepared in such form that it can be periodically revised to permit inclusion of new techniques and use of new materials or equipment as they are developed.

Our present policy for corrosion prevention on gas properties is to use good coating plus cathodic protection as a standard adjunct to all new distribution systems as well as to all new main construction in existing systems.

Company-Wide Application

In addition to the corrosion problems encountered on our gas properties our corrosion control program has been expanded to include problems connected with our electric operations. Our new electric generating stations are designed to avoid future corrosion troubles wherever possible. Where corrosive soils are encountered, cathodic protection is planned for underground lead covered power cables and periodically checked by our corrosion engineers and adverse corrosion conditions corrected as they are found. This is expected to prolong the life of these cables and reduce the possibility of service outages due to cable failures from corrosion.

Our corrosion control program has permitted us to adopt certain practices we would otherwise hesitate to do. In gas distribution networks which generally operate at pressures below 100 psi, standard pipe wall thicknesses are far greater than necessary for pressure. The extra thickness is for corrosion allowance. Since our practice is to fully protect all new mains, we now specify pipe weights averaging about 20% less than those for standard pipe when purchasing new pipe.

During periods of material shortages we found it necessary to build distribution systems with used pipe—some of it badly corroded. After reconditioning and coating such pipe and then applying cathodic protection to the completed system, we feel that a reasonably reliable distribution network resulted.

Our total cost for cathodic protection as of July 1, 1950, is $110,000, which represents approximately 1% of our total gas system investment, and an average cost of $160 per mile of 3-in. equivalent main protected. However, this figure should not be used as a guide for estimating costs on other systems since it is weighted by early high development costs and expensive installations on existing systems. The unit cost for a particular project will vary widely depending on whether or not the pipe to be protected is coated and whether it is an old existing system or is part of a new construction project. On old systems with poorly coated or bare mains under pavement, the total cost may be high. Possibly the following figures will help to demonstrate this:

1. The 1.2-mile section of 12-in. main protected in 1941 cost for materials, labor, and engineering, $5080 or $1080 per mile of 3-in. equivalent main. This was our first full-scale application of cathodic protection and reflects high development and training costs, and high cost of preparing the main for protection.

2. An entire town distribution system protected in 1941 cost, for materials, labor, and engineering, $1010 or $314 per mile of 3-in. equivalent main. This system was relatively easy to prepare for protection.

3. An entire new town distribution system protected at the time of construction in 1947 cost, for materials, labor, and engineering, $1383 or $119 per mile of 3-in. equivalent main. This lower cost reflects the advantage of preparing a system for protection at the time of construction.

More recently, on new systems, we have been able to reduce the total installation costs of protection to as low as $53 per mile of 3-in. equivalent main. On future new work where provisions for cathodic protection are incorporated at the time of construction, we hope to reduce our installation costs to $50 or less per mile of 3-in. equivalent main protected, or 1% of construction cost.

It is important to note that as our corrosion control program has developed, cost of applying protection to gas mains has steadily decreased even though general construction and operating costs have been on the increase.

Concerning the annual cost of operating and maintaining our cathodic protection system, some figures on our 1949 costs may be helpful. Although salaries and expenses for the general office and division corrosion personnel totaled approximately $24,000, the greater part of this was capitalized on new cathodic protection installations and other new construction projects. The total cost of material, time, transportation, and miscellaneous expenses chargeable to cathodic protection operation and maintenance was approximately $10,130. The cost of electric power to operate cathodic protection rectifiers during the year was $316. The total operation and maintenance cost of $10,446 represents an average annual unit cost of approximately $21 per mile of 3-in. equivalent main under protection.

Maintenance costs may vary widely from year to year and will markedly affect the total annual cost. As time passes, higher maintenance costs are to be expected on the older systems.

The annual savings which can be attributed to corrosion control are difficult to evaluate since we cannot determine exactly how many leaks would have developed if the program had not been initiated. If we are preventing one leak per year in each mile of 3-in. equivalent main under protection, an annual savings of at least $7500 in repairs is possible. In addition to saving in leak repairs and gas loss, we can, at our present rate of expansion, easily save $10,000 per year by buying lighter weight pipe. If we are eliminating the necessity for replacing even one mile of 3-in. equivalent main per year, that represents an estimated average saving of $6000. One replacement alone of 1500 ft of 12-in. main in a congested area which was planned in 1941 but made unnecessary by application of cathodic protection was expected to cost $10,500 at that time. The same replacement would cost much more at present day costs. There are also the intangible values of reduction of hazard from gas leaks and increase in customer good will due to improved service. Our attitude toward the entire program is that the cost balance is well on the credit side. From these examples, it is obvious that we save the cost of our cathodic protection several times over each year.

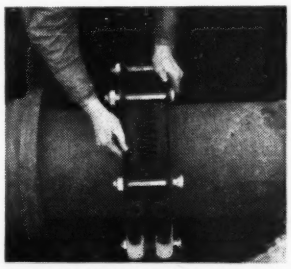
Conclusion

In conclusion, and to point up my theme of our attitude toward a corrosion control program, any company management now considering the use of such a program has the assurance of many companies, in addition to ours, that corrosion control and cathodic protection will work. Whether or not an organized program is adopted will depend on a determination, for the particular system being studied, of the value of reduction in maintenance costs and expenditures for replacements, of the value of savings in revenue loss through service outages, of the value of reduction in commodity losses, of the value of reduction of hazardous conditions caused by corrosion, of the value of increased customer good will through better continuity of service, and of the savings in material cost made possible by eliminating excess pipe weight for corrosion allowance.

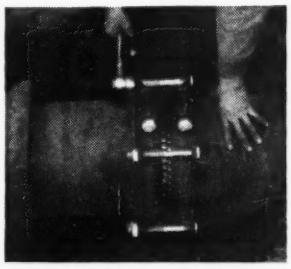
Clean pipe thoroughly — then center brass band over break, bending tab back to lock.

Thoroughly soap both sides of gasket and pipe with heavy soap water.

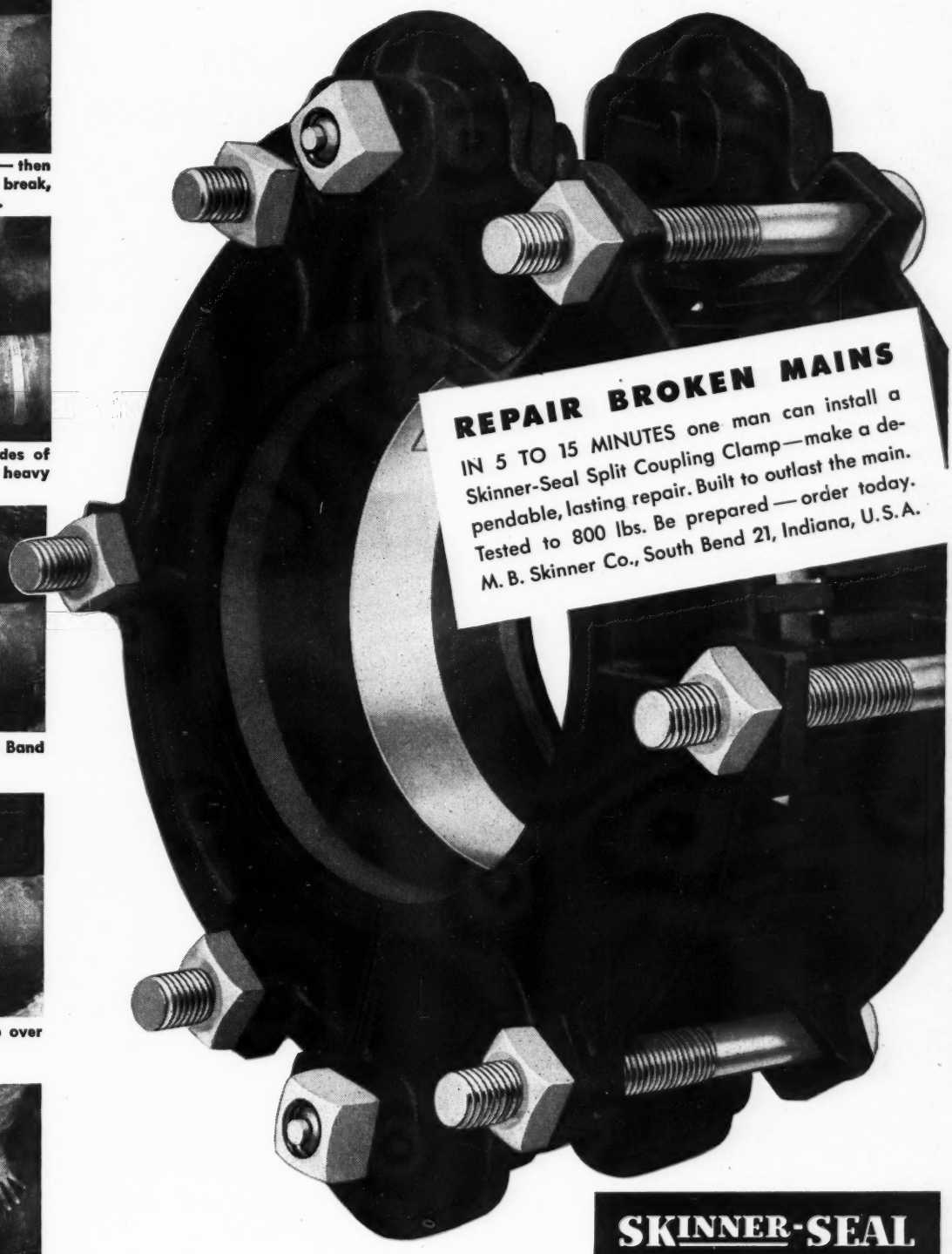
Center gasket and Monel Band over brass band.



Assemble halves of clamp over pipe and bolt together.



Insert pull bolts and tighten all around evenly.



REPAIR BROKEN MAINS

IN 5 TO 15 MINUTES one man can install a Skinner-Seal Split Coupling Clamp—make a dependable, lasting repair. Built to outlast the main. Tested to 800 lbs. Be prepared — order today. M. B. Skinner Co., South Bend 21, Indiana, U.S.A.

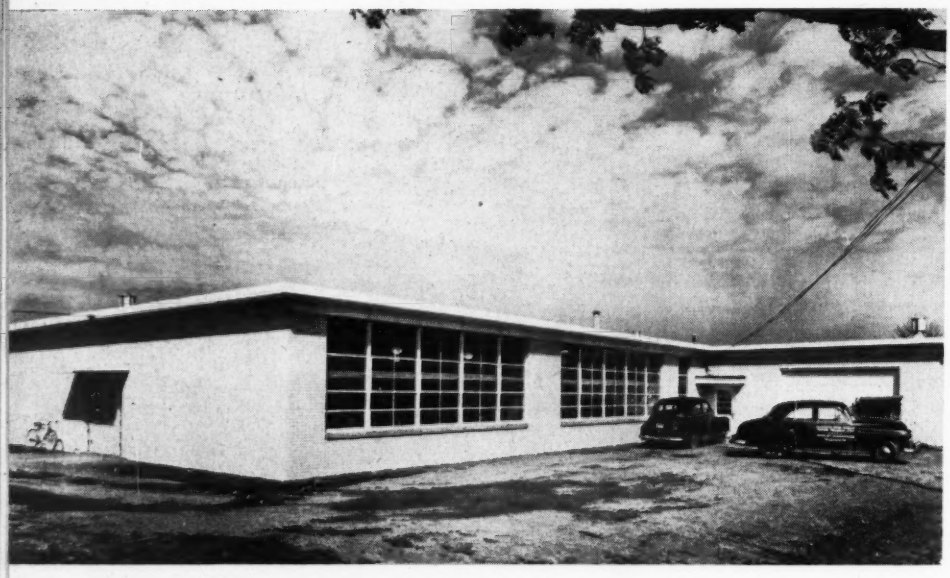
SKINNER-SEAL

SPLIT COUPLING CLAMP

M. B. SKINNER COMPANY, South Bend 21, Indiana

Direct-Fired Gas Heater Cuts Costs In Elderton's 'Expandable' School

Functionalism, economy, make modern, 'growing' school a model for future board of education planning.



MODERN, LOW-COST school at Elderton, Pa. was built functionally with future expansion in mind, has scientific color scheme, large windows, houses 230 students. Note car at right, used to teach students to drive.

COMBINING functional efficiency with economy has made the new Elderton Joint School in Armstrong county, Pennsylvania, a model for school boards. The new structure, located at Elderton, in western Pennsylvania 50 miles northeast of Pittsburgh, serves as part of the junior and senior high school for two townships and one borough.

Exclusive

Designed for easy expansion when school enrollment requires, the single-story building currently has four standard size classrooms, a workshop for manual training and vocational agriculture, an adjoining industrial arts planning room, and two washrooms. It is a supplementary building to the main high school located a few hundred feet away which eventually will be a grade school when proposed additions to the new building are completed. An average of 230 students now uses the two buildings.

Gas Saves Most

Despite the low cost ($8000 per standard school unit) not much was sacrificed in the way of conveniences essential for modern school operation. Savings were effected by such measures as painting the interior concrete block walls instead of plastering them. A pastel shade paint is used which, in the opinion of the architects, makes the walls nearly as attractive as if they had been plastered at much greater cost. Fibre tile was inexpensively installed on the ceilings of the classrooms and a plaster ceiling was used in the corridor. The joists were left exposed in the woodworking shop where appearance is not a major consideration.

Perhaps the greatest saving made by the Elderton Joint School board was in the combination heating and ventilating system specified for the school by the architects (Scheeren & Rittenhouse) with the approval of the school plant section, Bureau of School Administration, Pennsylvania Department of Public Instruction.

Control of air movement, temperature, and ventilation in classrooms is one of the most important considerations in school building design and construction but, as the Elderton Joint School demonstrates, this can be accomplished satisfactorily at a low unit cost.

Heating the School

It was estimated that the heating-ventilating system used at Elderton cost about one-third of quoted prices for a conventional steam heating plant. The way this problem was solved at the Elderton Joint School was to install a direct-fired heater with large air-handling capacity. The heater, a development of Dravo Corp., Pittsburgh, is fired by gas. It has an output capacity of 1 million Btu per hour and 11,000 cu ft of air per minute. Total installed cost of the warm air system was $5595, or approximately $860 for each of the 6½ units in the school.

Installed in a small (8 ft x 12 ft) furnace room off the main hall of the building, the heater is arranged so it operates on air recirculated from the classrooms plus fresh air drawn from the outside through an inlet in the roof of the heater room. Air to be heated is collected in a sheet metal plenum chamber alongside the heater by a fan powered with a 3-hp motor. In the heater the air flows over staggered banks of economizer tubes which carry flue gases from the combustion chamber to the vent stack. Then the air sweeps the heater's stainless steel combustion chamber and is discharged into ductwork leading to individual rooms.

The main duct, graduated in size from 14-in. x 52-in. nearest the heater

for "Jack-the-Giant-Killer" Foods

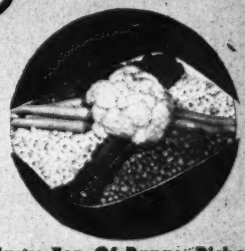
sell

"America's Finest Gas Range"

feature the "Big-3"

1. Exclusive ROPER "Staggered" Top

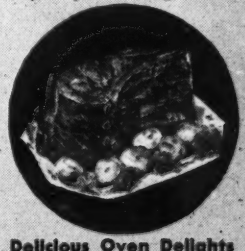
Most useful cooking top ever devised. Ends "reach-over" and "reach-around". Gives handy working surface next to each burner for more convenience.



Tasty Top-Of-Range Dishes

2. The One-and-Only "Bake-Master" Oven

Nothing else like it. Bakes and roasts with scientific accuracy. Unmatched for uniformity. Circulates heat evenly . . . holds the exact temperature wanted.



Delicious Oven Delights

3. The Revolutionary "Roper-Glo" Broiler

Sensationally fast. Burner directs infra-red heat rays clear to center of foods. Broils uniformly . . . chars outer surface if desired. A real sure-fire sales builder.

Tempting Broiled Treats

ROPER gives you more sales-clinching features to offer . . . more models . . . more oven and broiler combinations . . . more top burner arrangements. These fine ranges are made for use with any gas, including liquefied petroleum (bottled) gas. Increase your appliance sales and profits with ROPER — "America's Finest Gas Range". Proven acceptance.

Capitalize On These Other ROPER

Crowning Achievements

- "Center-Simmer" Top Burners
- "Insta-Flame" Lighters
- "Insta-Matic" Clock Control
- "Scientific" Cooking Charts

Geo. D. Roper Corporation · Rockford, Illinois

offices and warehouses in principal distribution centers

DUCTS carry warm air to classrooms from this furnace room, which has 1-million Btu Dravo "Counterflo" heater. Fresh and recirculated air are blended before being heated in the automatic furnace.

to 14-in. x 30-in. at the farthest point, is installed in a false ceiling in the main hall. The hall is 12 ft wide and two classrooms open off either side. From the main hall duct, individual 14-in. x 20-in. ducts are led to each of the four classrooms. Grilled wall openings 14-in. x 30-in. in the classrooms are near the ceiling and have spring-operated dampers so the warm air supply into each room can be controlled.

The space around the warm air supply duct above the false ceiling of the hall acts as a return air duct. From each classroom, return air flows into a floor level grille 20-in. x 32-in. and upward through a masonry duct to the return air space above the false ceiling. Exhaust ventilation of each classroom is accomplished by a 16-in. x 24-in. grille opening at floor level leading to a 12-in. natural draft air exhauster on the roof.

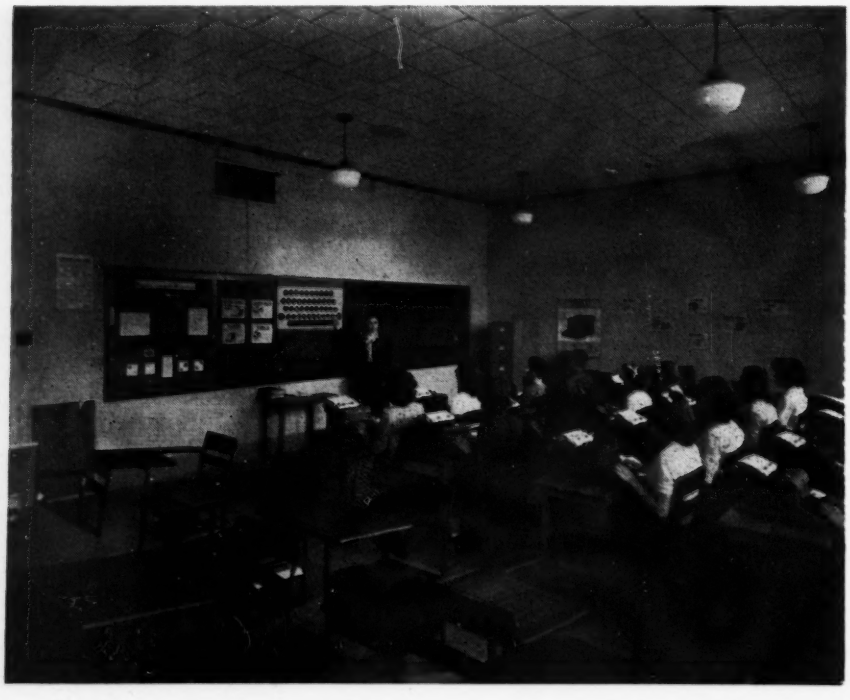
The heating-ventilating system is designed to provide 15 cu ft of fresh air per minute per pupil. This is accomplished by forcing air out of the classrooms through the exhaust ventilator with the pressure created by incoming warm air. The latter is a blend of fresh and recirculated air. Ventilation by opening windows is not necessary and students therefore are not subjected to drafts.

Each of the four standard classrooms off the main hall is 22 ft by 30 ft in size. Virtually all of the outside wall area of the classrooms is formed of ceiling-high windows which provide maximum natural illumination. Overhanging eaves prevent glare and excessive solar heat gains.

The workshop is approximately 40 ft x 30 ft in size, while the industrial arts planning room that adjoins it is 20 ft x 20 ft. Heating and ventilating arrangements for these two rooms are on the same principle as the four classrooms.

The new building is situated on a fairly level plot containing nearly 11 acres of ground. The exterior wall at one end of the building was not finished with glazed brick like the rest of the structure so an addition can be attached there at low cost when funds become available.

CLASSROOM has warm-air outlet with spring-actuated damper near ceiling, return air grille near floor (lower left). Walls were painted, not plastered.



Things to Come

Although Elderton's long-range project contemplates a rather large single-story structure containing 22 units and a combination gymnasium-auditorium, more immediate plans call for addition of two more classrooms on one end of the present building. In selecting the heating system for the new building, a Dravo heater with larger capacity than was needed for the immediate structure was installed. Thus, when the two new classrooms are added, they can be joined to the present heating and ventilating system merely by extension of ductwork.

Although a number of control arrangements can be employed with the type of heating system used at Elderton, a simple, inexpensive method was selected. This used a single thermostat, centrally located in the workshop, to control the off-on action of the heater and fan. Warm air input into each room is controlled, according to need, by spring-acting dampers on the individual inlets.

Temperature Control

Besides its economical initial cost, another advantage of the heating and ventilating system used at Elderton is its responsiveness to automatic controls. Since classrooms are occupied only during the daylight hours when outdoor temperatures normally are climbing, they must be heated quickly in the morning after being allowed to cool overnight. Then, as the outdoor temperature rises and the indoor temperature follows suit both from sensible heat given off by the occupants and the solar gain, the amount of warm air being discharged into the room is reduced.

The Dravo heater, being direct-fired, can be operated with the burner off to deliver fresh outside air for ventilation during the warm months. Conversely, it can supply heated air instantly from a "cold start." At Elderton, the school maintenance man turns down the controlling thermostat for weekends and at night with assurance that comfortable temperatures can be re-established in the classrooms quickly after the thermostat is again moved up each morning. In order to conserve fuel, he also closes the fresh air inlet at times when the building is not occupied.

Heating contractors were Heat Equipment Co., Kittanning, Pa.

White-Rodgers
DIAPHRAGM GAS VALVES
WHITE-RODGERS
Controls
FOR REFRIGERATION
HEATING AND
AIR CONDITIONING
ST. LOUIS 6, MO.
Branches:
NEW YORK
52 Vanderbilt Ave.
CLEVELAND
5005 Euclid Ave.
CHICAGO
800 W. North Ave.
Resident Sales Engineers in all Principal Cities

NEW PRODUCTS

Suspended Heater

NORMAN PRODUCTS CO., 1150 Chesapeake Ave., Columbus 12, Ohio.

MODEL: 360.

DESCRIPTION: Forced warm air is distributed horizontally in a 360° radius through seven diffusor rings, mixes with warm ceiling air and flows with the normal convection

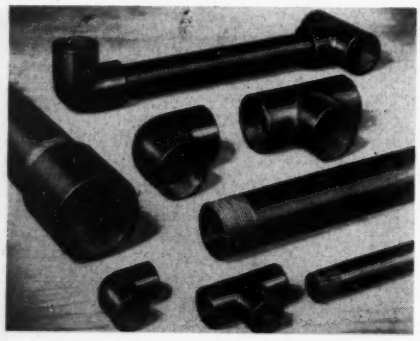
circulation at low velocities down the walls, blanketing the entire floor area on its way back to the return air intake in the bottom of the unit. Forced exhaust of combustion products eliminates venting problems, and shallow depth (12½ in.) allows ample head room in low-ceiling applications. Burner is a single-port, self-piloting, flame-retention type. Capacity: 100,000 Btu.

Plastic Pipe

CARLON PRODUCTS CORP., 10181 Meech Ave., Cleveland 5, Ohio.

MODEL: Carlon "TL."

DESCRIPTION: This new pipe is furnished in threaded sections with molded plastic fittings. It comes in 20-ft lengths and incorporates standard international pipe threads. TL can be threaded and cut with standard



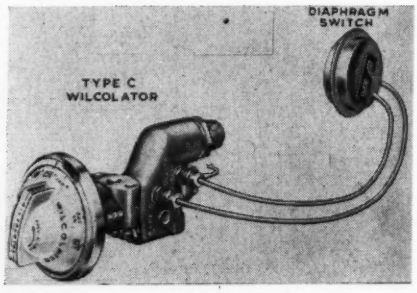
pipe-fitting tools. Features pointed out by the manufacturer include light weight (about one-ninth the weight of steel), ease of fitting and makeup, and complete immunity to rot, rust, and electrolytic corrosion. Sizes from ¼- to 2-in. are available. It is recommended for working temperatures up to 140°F.

Heat Control

THE WILCOLATOR CO., 1001 Newark Ave., Elizabeth, N. J.

MODEL: Oven-Reddy.

DESCRIPTION: The Oven-Reddy is incorporated in the standard Wilcolator gas oven thermostat and automatically turns on a signal light when the oven reaches the temperature the housewife has set on the control



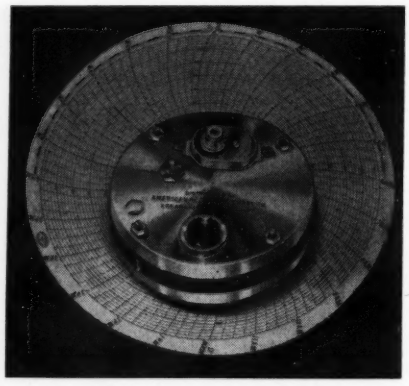
dial. The control is a gas-operated diaphragm switch in a metal box which is attached to the thermostat by two small copper tubes. One tube transmits the inlet gas pressure to one side of the diaphragm, and the second tube transmits the outlet gas pressure to the other side. The switch may be connected to a 115-volt signal light on the back or front panel or wherever the manufacturer desires.

Chart Clock

AMERICAN RECORDING CHART CO., 3113 E. 11th St., Los Angeles 23.

MODEL: Arcco Macnick chart clock.

DESCRIPTION: With one winding of the clock, continuous readings may be taken over a period of eight days with this device. The clock, which is adaptable to nearly all in-



struments using chart clocks, is hermetically sealed and has been engineered to insure accurate operation under all field conditions. Ample power is provided by an extra heavy main spring. Light balance wheel is set in jewel bearings. Details are given in catalog No. 104A.

Radiation Instruments

MINNEAPOLIS-HONEYWELL REGULATOR CO., Brown Instruments Division, Philadelphia.

MODEL: Radiamatic series.

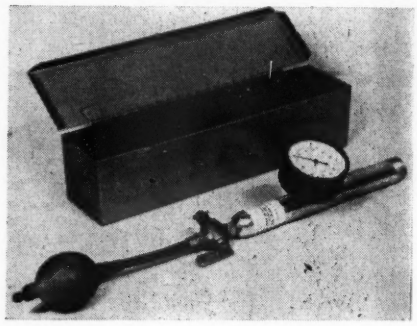
DESCRIPTION: This series of radiation measuring instruments for recording temperatures from 125 to 7000°F will measure temperatures in destructive atmospheres, on large surface areas, where work moves or rotates, or where temperatures are above thermocouple range. Included are a low-intermediate radiation pyrometer with a calcium fluoride lens for 200 to 1200°F, an intermediate with a fused silica lens for 800 to 2300°, and a high with Pyrex lens for 1000 to 3200°. Lenses are available for either narrow or wide angles. Other parts of the series include a low-range model (125-350°F), a small target model (1700-3200°F), and a very high model (3000-7000°F).

Line Tester

MARBRO MANUFACTURING CO., Dept. Y, 1620 Lee Rd., Cleveland 18, Ohio.

MODEL: Gauge Rite air tester.

DESCRIPTION: The Gauge Rite, which tests gas leaks in terms of ounces, is a compact and light weight gas line tester, weigh-



ing about one-sixth of most testers in common use, the manufacturer states. The 1½-lb unit includes a metal carrying case. Pressure is built up by squeezing the small aspirator a few times with the fingers. The gauge registers up to 20 oz, with 10 oz recommended as the correct test pressure. The valve is a spring-loaded, ¼-turn, snap action type and the body is a standard ¾-in. thread. Adaptors can be applied to increase or decrease pipe size.

Fittings Package

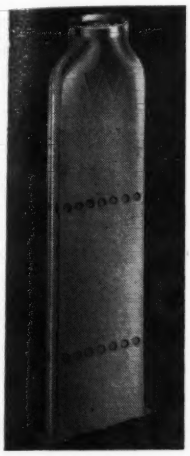
DETROIT BRASS & MALLEABLE WORKS, 100 S. Campbell Ave., Detroit 9.

MODEL: Packaged malleable pipe fittings.

DESCRIPTION: Carton-protected malleable pipe fittings simplify stocking and handling. The fittings are packaged in quantities to fit individual needs. Individual shipping cartons can be reshipped without additional wrap-

pipe or packing. Cartons, which are available for both black and galvanized malleables, are delivered in strong master containers. Additional advantages claimed are no lost time in counting, no emptying of bags, and no lost bin space.

Heater Vent



WILLIAM WALLACE CO., Belmont, Calif.

MODEL: QC (Quick-Coupling) Metalbestos Wallvent.

DESCRIPTION: This vent may be installed with safety within ⅜ in. of combustible walls. It embodies double-wall construction, and in addition, the new rectangular design allows the vent to be placed within standard 2 × 4-in. walls without thicker studding, furring out, or metal sheathing.

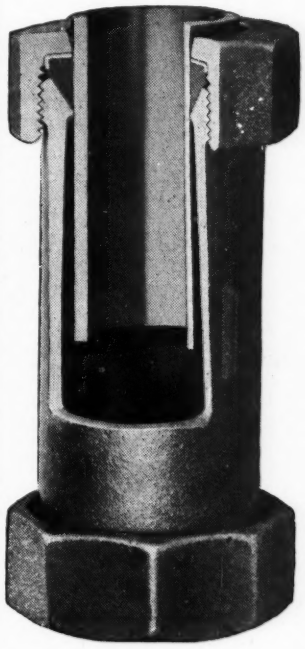
As the heater operates, the inner flue pipe carries off hot combustion gases. Insulating air between the double walls confines heat to the inner pipe and keeps the outer aluminum casing and adjacent walls cool. Furnished in 3-, 4-, and 5-ft lengths, the Wallvent fits over the wall heater's flue nipple and extends through the ceiling.

The vent is approved by Underwriters' Laboratories.

Other New Developments

Two gravity warm air gas furnaces are the newest addition to the Superfex line manufactured by Perfection Stove Co., Cleveland, Ohio. Model 64 is unique in that it is the only gravity warm air heating system currently equipped with pilot, coasting, and booster fires, automatically controlled. Model 65, for budget-minded home owners, has two stages of fire—pilot and high . . . An enamel which, according to the manufacturer, will coat radiators and kitchen ranges without cracking, peeling, or discoloring when heated up to 500°F is now on the market. Designated Sapolin radiator and range enamel, the paint is available at hardware and department stores or from Sapolin Paints Inc., 229 E. 42nd St., New York City. . . Latest addition to Detroit-Michigan Stove Co.'s (Detroit) Garland line of commercial cooking equipment is a roasting oven. Available as a single unit (two ovens) or double unit (four ovens), it features powerful loop type burner, improved heat controls, and automatic oven ignition. . . General Scientific Equipment Co., Philadelphia, has announced availability of its protective mask No. 48-A for use in atmospheres contaminated with non-toxic dusts. The aluminum shield, elastic headband, and replaceable laminated filter weigh only ½ oz. and the mask is more effective than costlier ones, the manufacturer says, because workers will wear it more consistently, since it is light and comfortable.

NORMAC
COUPLINGS, SLEEVES and FITTINGS

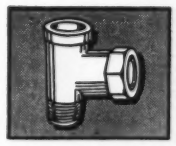


for maximum deflection, ease of "stabbing," complete confinement of the rubber!

So close are "Normac" rubbers confined at the gasket tip that possibility of flow is reduced almost to "nil." These couplings, sleeves and fittings . . . approved by gas utility men across the country for their time-saving features, ease of handling and dependable service . . . are available in a complete range of sizes. Made from air furnace malleable iron they provide greater wall thickness than pipe on which used.

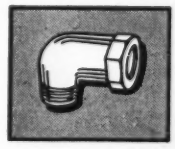
NORMAC COUPLINGS are made with 5" centers in all sizes. NORMAC SLEEVES are identical in design except that they are made with 10" centers. Nuts and gaskets are interchangeable.

COMPRESSION-END SERVICE "TEE"



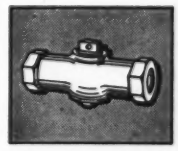
First fitting of this type ever produced with full coupling depth and special threads on male end to prevent dropping into old hand taps when used to replace standard threaded fittings.

COMPRESSION-END SERVICE "ELL"



Extra depth makes it possible to "stab" pipe into stops and without measuring, pull back a safe distance to allow ultimate deflection eliminating possibility of strain against tap in main.

COMPRESSION-END IRON BODY BRASS CORE SERVICE STOPCOCKS



End the necessity of threading on the job plus the elimination of the threads themselves — combining all the advantages of NORMAC COUPLINGS and the best in stopcock design. 2½" coupling depth on each end.

NORMAC BRASS FITTINGS DEVELOPED IN 1939 FOR USE WITH COPPER TUBING

Our complete line of brass fittings can be used either on new installations or where copper is run through old steel pipe in large or small openings. The center to end dimensions of NORMAC TEES correspond with old malleable iron fittings. This feature is extremely important in the use of these fittings in one foot openings where the tubing must line up with the steel which has been removed.

Write for the NORMAC CATALOG of Gas Distribution Equipment

NORTON-McMURRAY MFG. CO.

39 SOUTH LA SALLE ST. • CHICAGO 3, ILLINOIS

Couplings • Meter Bars • Sleeves • Cocks • Bell Joint Clamps • Service Tees & Ells

FIRE PREVENTION

plus INSURANCE SAVINGS

Savings in insurance premiums of $6,000.00 per month, and reduction of 500 different policies to three, were obtained by one extraction processor, due to the elimination of fire and explosion hazards in his three plants, essentially aided by R-C Inert Gas Generators.

Admitting that this instance is exceptional because of the size of the plants, the amount of insurance, and other factors, nevertheless it is apparent that both large and small companies may make important savings in insurance costs, and provide improved protection against business interruption and property damage, where explosion and fire hazards must exist in their processing.

Through the use of inert gas, economically generated by R-C units, hazardous plant locations can be made safer against explosion and fire, thus proving again that "an ounce of prevention is worth a pound of cure". Portable units are readily movable from one plant to another, or stationary units can be installed where such hazardous conditions must be continuously contended with.

Roots-Connersville has made many successful installations. Ask us to send you Bulletin 100-B-14. There is no obligation.

ROOTS-CONNERSVILLE BLOWER CORPORATION
512 Oregon Avenue, Connersville, Indiana

ROOTS-CONNERSVILLE
BLOWER BUILDERS R-C SINCE 1854
ONE OF THE DRESSER INDUSTRIES

FINANCIAL

1949 Natural Gas Sales Top $1 Billion Mark

Revenues from sales of natural gas to ultimate consumers topped the one billion dollar mark for the first time last year, AGA has reported. Sales for 1949 brought in a staggering $1.09 billion, as compared with $995 million in 1948.

Total operating revenues, which hit $1.69 billion for a new industry high, were up 6.9% from the previous year. LP-Gas utilities boosted their revenues 19.5% in 1949 over 1948. Revenues were $18.7 million in 1948, $22.3 million last year.

The statistics are contained in the recently released AGA publication *Gas Facts*.

Both July and August operating revenues for natural gas companies were very high, too. FPC has reported revenues of more than $77.5 million for August, 24.5% above totals for the same month last year. July 1950 revenues were $76.87 million, an increase of 26.2% over the $60.9 million received in July 1948.

Tulsa Firm Plans $18.9 Million Budget, Acquires Utilities

Anticipating its $18.9 million construction program for 1951, Oklahoma Natural Gas Co., Tulsa, has already acquired four other gas companies and has bought a 26% interest in Carter Oil Co.'s Garvin county processing system.

Also on the program are extensions of the company's transmission and distribution systems which will together take about a $10 million bite out of the budget.

The four companies — Guthrie (Okla.) Gas Utilities Co.; Kingfisher Gas Co., which serves Kingfisher, Hennessey, and Dover; Oklahoma Central Gas Co., Crescent; and General Fuel Corp., a transmission system— were formally taken over Nov. 1 through an exchange of stock. About 6000 new customers have thus been added to Oklahoma Natural's system.

The Carter plants include three natural gasoline installations processing 110 MMcf per day of natural gas, returning about 21 MMcf to formation. Nearly a quarter million gallons per day of liquids are also produced. The plants are located at Antioch, Lindsay, and Maysville.

Included in the transmission budget are 40 miles of 16-in. from the "Golden Trend" area to the system near Chickasha, and 52 miles of 26-in. linking the West Edmond field and a new storage project at Depew.

New meter shop buildings will comprise a large share of the distribution allotment.

NoNatural Asks 2nd Rate Boost, Loses in Curtailment Fight

Rates and customer classifications are giving Northern Natural Gas Co., Omaha, trouble these days, as is evidenced from two cases currently before the Federal Power Commission.

The big pipeline company, which supplies

gas distributing companies in Iowa, Kansas, Minnesota, Nebraska, and South Dakota, and has recently upped its system capacity from 470 MMcf per day to 600, wants to boost charges to 28 utility customers to the tune of $5.2 million. Coupled with the requested $4.1 million increase already requested and still pending, the latest plan would bring added revenue of about $9.3 million.

The previously petitioned increase was suspended by FPC April 26, and has never been settled. When Northern effected it Sept. 27, the company had to post a bond to cover possible refunds.

The second problem, involving service to Metropolitan Utilities District, Omaha, was tentatively settled last month with an initial decision, subject to commission review. The examiner's order directs Northern to provide service to Metropolitan for resale to industrial customers in Omaha on the same basis of classification for curtailment purposes as prevailed when Northern itself was serving them.

Furthermore, approval was given to the abandonment by Northern for sale to Metropolitan of pipeline facilities used to serve six industrial customers and the establishment of physical connection with Metropolitan by the continued utilization of facilities now used by Northern for delivery to two other industrial customers.

Northern had contended that the customers it was transferring to Metropolitan must be considered new customers for purposes of curtailment classification. Northern also had contended that Metropolitan must buy the facilities used to serve the two customers, under terms of an option agreement.

Wisconsin, Central Hudson Report Big Househeating Sales Increases

The state of Wisconsin and the mid-Hudson valley of New York both reported big increases in househeating installations following recent conversion to natural gas.

In a report published by the Wisconsin utility companies, it was revealed that 30,057 new househeating customers were added in the state during 1950. An additional 33,164 homes will convert to natural for househeating in 1951 if materials are still available. To date, more than $59.6 million has been spent for natural gas equipment and facilities in Wisconsin.

Central Hudson Gas & Electric Corp., meanwhile, reported that it has added 905 new househeating customers thus far in 1950. The significance of this total carries more weight when it is pointed out that 1350 gas househeaters were sold by Central Hudson in the previous 26 years—since it first offered gas for househeating in 1926. A further increase of 2350 new customers is expected in 1951.

Financial Footnotes

United Natural Gas Co., Oil City, Pa., "is engaging in unfair competition with private dealers in the sale of appliances," according to a protest filed with the state utility commission by the United Counties Warm Air Heating Assn., Harrisburg. The dealer association asked that the commission direct United to eliminate appliance sales and confine its operations to the sale of gas.

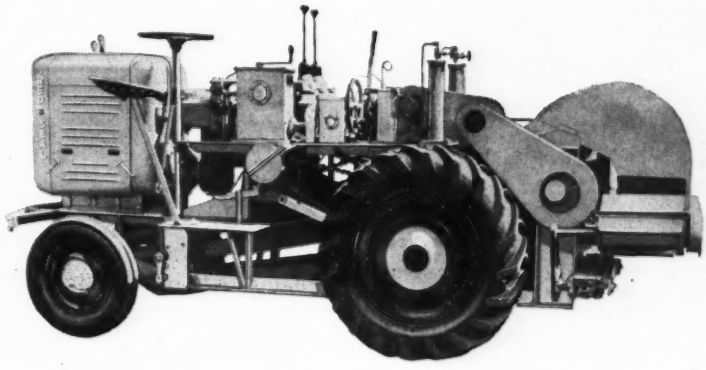
For

Small Ditch Digging

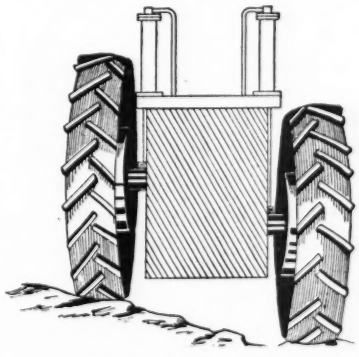
no other machine equals the

LONGHORN

in Speed, Economy, Dependability, Versatility



"Hip Action" Keeps Ditch Vertical



The hydraulically operated "hip action" of the rear wheels enables operator (without leaving his seat) to level up and dig a vertical ditch, without undercutting, on a lateral slope up to 30 per cent. This is one of many features of the Longhorn Mobile Ditcher.

In the oil fields, on construction jobs, on city utility work, wherever there is small ditching, the Longhorn Mobile Ditcher has proved its value.

Your request will bring an interesting, factual story of this machine and its performance.

LONGHORN INDUSTRIES, INC.

Box 350, Henderson, Texas

NEW IMPROVED MODEL "B"

Longhorn Mobile Ditcher

The Upham Gas Co., Mineral Wells, Texas, withdrew its application for increased gas rates when the city commission agreed to allow the company to add a penalty of one-ninth to the original bill on delinquent accounts. The utility says this practice will eliminate considerable collection expense, as well as bringing in additional revenue.

Late November hearings scheduled by the FPC included El Paso Natural Gas Co.'s proposal to sell certain facilities in the El Paso area to its wholly-owned subsidiary, El Paso Gas Transportation Corp., which was to be considered Nov. 21, and further proceedings on Colorado Interstate Gas Co.'s plan to acquire the facilities of Canadian River Gas Co., Amarillo, scheduled for Nov. 30.

An important new customer for Cities Service Gas Co., Oklahoma City, is the chemical plant being built at Lawrence, Kan. by Westvaco Chemical Division of the Food Machinery & Chemical Corp. of New York. The 15-acre plant, which will process phosphorus, will take 650 Mcf per day.

Acquisition of gas utility properties of Indiana Gas & Water Co. Inc. has been filed with FPC by Greenfield (Ind.) Gas Co. Inc. Greenfield asks FPC to (1) disdain jurisdiction over the transaction, or (2) authorize the acquisition and operation of the facilities. These include facilities for serving natural gas to Fortville, Ingalls, McCordsville, and Mohawk, Ind. Greenfield would pay $45,000 to Indiana Gas for the properties.

after 20 YEARS

METAL RIM LMPCO

It's an old story—superior quality proves itself over the years. And that's why you can be sure of better meter performance and longer service life when you order LMPCo Metal Rim Diaphragms.

Gas Company records across the nation show LMPCo Metal Rim Diaphragms still on the job 20 years or longer after installation. And backing up this longer wear are accurate measure records that just can't be matched.

With these facts on record from coast to coast, there's no need to accept a substitute or compromise with quality. LMPCo Metal Rim Diaphragms are your guarantee of superior performance and endurance.

Write today for complete details.

LMPCO METAL RIM DIAPHRAGMS

- ★ are not wet, blocked formed or stretched
- ★ are oiled with LMPCo special diaphragm oil
- ★ are quality made . . no rim or port hole leaks
- ★ are easy to install and easy to prove

METAL RIM DIAPHRAGMS

Lancaster METER PARTS CO.

POST OFFICE BOX 378 . . . LANCASTER, OHIO

MANUFACTURERS

Rheem to Market New Gas Absorption-Type Refrigerator

A second gas-absorption type refrigerator will be on the market sometime in 1952. R. S. Rheem, president of Rheem Manufacturing Co., announced last month that his company is well along the way on plans to have the refrigerator in production within the next two years.

Rheem Manufacturing will produce the gas refrigerator just developed by Clayton & Lambert Manufacturing Co., of Chicago and Louisville. Clayton & Lambert will not receive royalty payments on the refrigerator; Rheem bought exclusive rights for its manufacture outright.

Having been in the development stage for five years, the appliance will be available in popular capacities. It will be sold under the Rheem name. Volume production for marketing will not get under way until further testing and design studies have been made—probably mid-1952.

A-P Controls Corp. New Name

Automatic Products Co. of Milwaukee has changed its corporate name. Hereafter, the company will be known as A-P Controls Corp., E. A. Vallee, executive vice president, announced last month.

The new name more properly reflects the company's products, Mr. Vallee said. A-P manufactures automatic and thermostatic expansion valves for refrigeration systems, solenoid valves in all sizes, water regulating valves, constant pressure valves, strainers, and dryers.

In addition, the company has recently developed controls for gas heaters and furnaces.

The company's Canadian affiliate, recently organized, will be known as A-P Controls Corp. Ltd.

Four Companies Increase Prices

Four gas range manufacturers last month announced price increases ranging from 3 to 5%, necessitated because of increased materials and components costs.

The companies involved were Tappan Stove Co., Mansfield, Ohio—upped prices an average of 3%; American Stove Co., St. Louis, 4 to 5% on three of ten models;

Seattle Pays 'Em to Vote

Seattle Gas Co. has admitted that it bought votes in last month's national and state elections.

In fact, it's boasting about it—and understandably.

What President N. Henry Gellert wanted to accomplish was a big vote, with as many as possible of Seattle Gas' employees exercising their duty to go to the polls. So it was agreed that every employee — except supervisory personnel — who signed a statement on the day after the election certifying that he had voted would be given an extra half-day's pay as a bonus.

Florence Stove Co., Gardiner, Mass., 3 to 5%; and Welbilt Stove Co., Maspeth, N. Y., 4 to 5%.

Several manufacturers expressed fear that a new round of increases may go into effect when new lines are introduced in January. Crucial steel shortages were also predicted by a number of executives.

MISCELLANY

Texas A&I Plans Gas Research

Natural gas research will receive important new attention at Texas A&I college (Kingsville) as the result of recent accreditation in petroleum and gas engineering by the Engineers' Council for Professional Development. Announcement of the accreditation was made last month by Dr. Frank H. Dotterweich, director of the college's division of engineering.

Immediate progress in research at Texas A&I has been insured by establishment of a fellowship in research at the college by the Chicago Corp. South Texas oil and gasmen have been working closely with A&I gas and oil research for some time, Dr. Dotterweich said, and should share credit for receipt by the college of the national accreditation.

Greeley (Colo.) Gas Co. conquered a three-pronged public relations threat this year, and did such a memorable job that it won the Denver Advertising club's award of the year for "outstanding work in public relations in Colorado."

Within five months, the utility changed ownership, was forced to request a rate increase, and remodeled its headquarters. The problem was a stickler: the rate increase, caused by a boost in price by Greeley Gas' supplier, had to be shown as no fault of the new owners — it would have happened anyway. Then, the cost of a new building had to be shown as separate from the rate increase the company had just won. Greeley's representatives did the job beautifully—not a single petition was submitted in opposition to the rate increase, and no after-effects of the building renovation have been felt.

The Denver club's award was presented to company executives (above, left to right: B. E. Jack, vice president; Paul Good, vice president and general manager; and Homer Lanning, secretary-treasurer) at a Denver chamber of commerce luncheon. Copies of the scroll were presented to the utility's ad agency, Gaylen E. Broyles, Denver, and to the account executive, Dorothy Davis Smith.

Newsnotes

This year marks a centennial of gas service to Harrisburg, Pa. by the Harrisburg Gas Co., and in commemoration of the anniversary, the company has published an attractive history of the company's progress titled "A Century of Public Service."

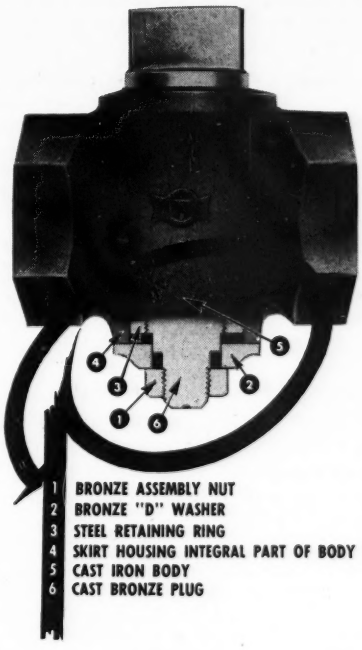
From its modest beginning, when it served gas for lighting purposes to state buildings and a few residences, the company has grown to serve about 47,000 customers today with all of the modern conveniences that gas can offer. This year, Harrisburg hooked up with the natural gas pipelines from the Appalachians and from Texas.

Reproductions of the Code of Safe Practices recently adopted by the Liquefied Petroleum Gas Assn. have been prepared for distributing companies adopting it, executive vice president Howard D. White has announced. The code covers practices regarding personnel, equipment and installation, appliances, automotive, tools, and regulations.

HAYS®

TAMPER-PROOF GAS STOPS

FEATURES


1 BRONZE ASSEMBLY NUT
2 BRONZE "D" WASHER
3 STEEL RETAINING RING
4 SKIRT HOUSING INTEGRAL PART OF BODY
5 CAST IRON BODY
6 CAST BRONZE PLUG

- Tamper-Proof Design with Non-Removable Plug.
- Extra Grade Gray Iron Body, Gas Service Bronze Plug.
- Steel Retaining Ring Prevents Removal of Plug.
- Steel Retaining Ring Assembled to Bottom of Plug—Eliminates Possible Damage to Precision Ground Surface of Plug and Body.
- Steel Retaining Ring Threaded and Staked to the Largest Metal Diameter on Bottom of Tapered Plug—Assures Retention without Distortion.
- Steel Retaining Ring Anchored without Drill Hole or Pin—Eliminates Possible Shearing of Plug.
- Steel Retaining Ring Located below Shoulder of Body—Permits Freedom for Service Adjustment of Plug.
- Steel Retaining Ring Recessed and Inaccessible within Iron Body—Gripless and Shearless.
- Plug and Body Precision Ground and Matched for Perfect Seating.
- Individually Tested Under Rigidly Controlled Inspection.
- Lubricated with a Compound of Greases Suitable for Use with Manufactured, Natural or Liquid Petroleum Gases.
- Obtainable in a Variety of Patterns.

Write for Folder 120-C D

AVAILABLE IN

Black or Galvanized

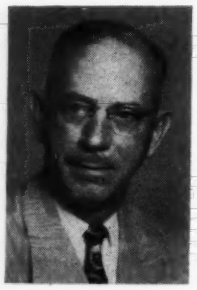
Flat Head Less Check
Flat Head With Check
Flat Head With Lock-Wing

Sizes; ¾"—1"—1¼"—1½"—2"

Also HAYS STANDARD
HEAVY PATTERN IRON BODY GAS STOP

For 75 Years the Gas Industry has relied on HAYS Iron Body Gas Stops

PEOPLE



J. H. Satterwhite
... Westcott & Greis

J. H. Swallow
... Bryant

H. Gottwald

W. A. Marsteller
... Rockwell Manufacturing

Westcott & Greis Inc., Tulsa, a division of American Meter Co. (New York) since 1933, has a new president. J. H. SATTERWHITE, long-time gasman and employee of Westcott & Greis and its predecessors since 1917, recently was elected to the office.

Bryant Heater Division, AGE, Cleveland, recently announced the opening of a branch office in Detroit. J. H. SWALLOW, former southern district sales manager, has been appointed manager of the new branch, located at 617 Central Detroit Warehouse, 10th and W. Fort streets. CHARLEY LOCKHART, former assistant to Mr. Swallow, has succeeded him as southern district sales manager, Dallas.

WILLIAM A. MARSTELLER, vice president of Rockwell Manufacturing Co., Pittsburgh, and Edward Valves Inc., East Chicago, Ind., will leave Jan. 1 to establish The Marsteller Co., marketing and advertising consulting firm, in Chicago. Rockwell also has announced the appointment of H. GOTTWALD as assistant vice president of the company's meter and valve division.

New Chattanooga district sales engineer for the F. J. Evans Engineering Co., Birmingham, is PAUL E. CRAFTON. He will specialize in the sale of Surface Combustion Corp. heat treating furnaces and burners and Webster Engineering Co. industrial burner equipment.

Election of PAUL J. IMSE as vice president and secretary of Milwaukee Gas Light Co. and appointment of ERNEST G. BLACK as treasurer were announced recently.

An independent field sales organization has been set up by Minneapolis-Honeywell Regulator Co. for its valve division. Regional managers and a staff of more than 20 will promote diaphragm control valves throughout the U. S. Managers assigned to the new setup are R. SCHLEGEL, New York; T. L. SMITH, Philadelphia; G. W. BROWN, Cleveland; R. R. SCOTT, Chicago; L. CROWE, Atlanta; C. F. WOODS, Houston; and W. A. CLEMENTS, Los Angeles.

Southern Counties Gas Co., Los Angeles, has announced the appointment of ROBERT T. DENTON to succeed the late WALTER GELDERT as Orange county division sales supervisor. Mr. Denton has served SoCounties in sales, operating, and personnel department activities.

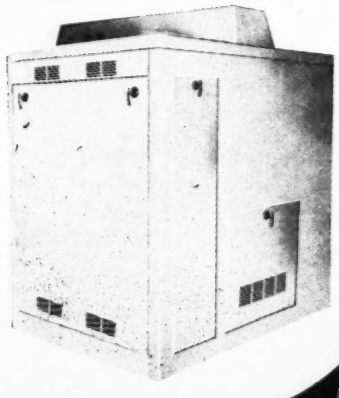
An intensive study of gas heating markets has been launched by Timken Silent Automatic Division, Detroit, under the supervision of WILLIAM R. WINTER, newly appointed gas heating sales engineer. Mr. Winter spent 11 years with Brooklyn (N.Y.) Union Gas Co.

Portland (Ore.) Gas & Coke Co. has announced the appointment of HAROLD R. SEYKOTA as manager of by-products sales. Mr. Seykota has been Seattle sales manager for the Converse Co. and, prior to that, he built plants and additions in Seattle and Brazil for the Liquid Carbonic Corp.

Manager of American Stove Co.'s (St. Louis) Pacific sales division is J. J. EDWARDS, who took over Dec. 1. He replaced J. J. KNOTEK, who will move to a new position.

Anyone Washing Bottles Needs This Heating Unit!

• The old expensive, troublesome system of operating a boiler to heat bottle washer solutions should be a thing of the past in any modern plant. The Evans Heating Unit provides AUTOMATIC maintenance of solution temperatures—at about one-half former fuel cost, plus additional savings in time, insurance and bottles! Every gas representative should know the FACTS about the Evans Unit. Write us NOW!



G. C. EVANS SALES COMPANY
LITTLE ROCK, ARKANSAS

EVANS
• • • • • AUTOMATIC HEATING UNITS • • • • •

Three field representatives have been added to the sales staff of the temperature controls division, Perfex Corp., Milwaukee. HUGH C. CAMERON is district manager for Indiana and HUGH H. HACKETT JR. for Pennsylvania, Maryland, and Virginia. Appointment and training of Perfex distributors throughout the country will be handled by WILLIAM P. MCDOWELL.

Two sales positions in the home appliance division, Murray Corp. of America, Scranton, Pa., have been filled from within the company. FRANK E. JOHNS, west coast

Frank E. Johns

C. M. Campbell

regional sales manager, has been appointed sales manager of national distribution, and CHARLES M. CAMPBELL, assistant contract sales manager, is now contract sales manager.

Consolidated Edison Co. of New York Inc. has elected HARRY J. BAUER vice president in charge of purchasing and stores, fuel and commercial buildings. He will retain his post as president of New York Steam Corp., a ConEd subsidiary. The company also has named KENDRICK F. BELLOWS, an industrial management expert, assistant to the chairman.

A territory including parts of New York, Pennsylvania, and Massachusetts has been assigned to LAVERNE N. ZIMMERMAN, newly appointed district representative of the L. J. Mueller Furnace Co., Milwaukee. Mr. Zimmerman has established headquarters in Kenmore, N.Y.

Equitable Gas Co. and affiliates, Pittsburgh, have named JAMES B. HALL manager of accident prevention for the system.

James B. Hall

He will plan the companies' accident prevention program, supervise workmen's compensation activities in Pennsylvania and West Virginia, and have charge of the suggestion plan. Mr. Hall joined Equitable as a cadet engineer in 1937 and was serving as safety supervisor, production and transportation department, until his recent appointment.

Three additions to its staff have been announced by General Controls Co., Glendale, Calif. GORDON STEINHOFF has been named manager of the firm's expanded aircraft division. Liaison between this division and governmental agencies will be handled by J. B. MILLER from his Washington, D. C. headquarters. R. D. HOLLINGSWORTH will specialize on refrigeration controls in the Cleveland, Buffalo, and Cincinnati territory.

ROBERT K. GUY has replaced DONALD W. MILESTONE as service manager of the cook stove and heater division, Perfection Stove Co., Cleveland. Mr. Milestone recently was named export manager. The company's Oakland, Calif., district has employed HARRY CRAMER, a manufacturer's agent, as a salesman in the San Francisco area.

Crane Co., Chicago, has appointed J. W. GREENE assistant manager of the valve and fitting department. He was serving as sales manager of the company's New York branch.

SAMUEL GRAFF MILLER, who has been associated with Philadelphia Electric Co. since 1947, recently was appointed assistant general counsel.

At a recent meeting of the board of directors of Eclipse Fuel Engineering Co., Rockford, Ill., A. C. PERKS was elected president and general manager. Mr. Perks was formerly executive vice president in charge of production. H. P. HOWELL, formerly president, was chosen chairman of the board.

Consolidated Edison Co.'s general stores manager, JOHN KROHN, retired Oct. 1 after nearly 30 years with the company. He had been in stores work for the past 25 years.

LEAK-PROOF Connections!

RECTORSEAL #2

Prevent leaks by applying RECTORSEAL to threads before making up the connection. Rectorseal is easy to apply directly from the brush-top can . . . it flows on smoothly and evenly . . . changes to a tough consistency . . . does not become hard and brittle . . . makes a permanently leak-proof connection.

It is easier to prevent leaks in gas lines than repair them. It's cheaper and safer, too. Rectorseal #2 has been proved by 12 years use in the oil fields. It is unaffected by petroleum or any of its fractions.

Be sure every installation is leak-proof, trouble-free and safe, by using RECTORSEAL #2 on every threaded connection. Make Rectorseal #2 a standard item on all construction crew trucks. Order your supply, now!

RECTORSEAL, Dept. B
2215 Commerce Street, Houston 2, Texas

RECTORSEAL #2
Patented Trade Mark Reg U S Pat Off

HOW TO

keep out of the pavement breaking business!

. . . . . .

from a 2′ 6″ by 7′ 6″ trench Hydrauger BORES a straight open 200′ long hole. Bore diameters — 2″ through 24″.

The BETTER WAY to install short runs of PIPE

FREE BULLETIN!

HYDRAUGER CORP., Ltd.
681 Market St., San Francisco 5, Calif.

Without obligation, please send me a copy of Hydrauger Bulletin which shows the low costs and high speeds of the Hydrauger.

*Name*_____

*Address*_____

*Company*_____ *State*_____

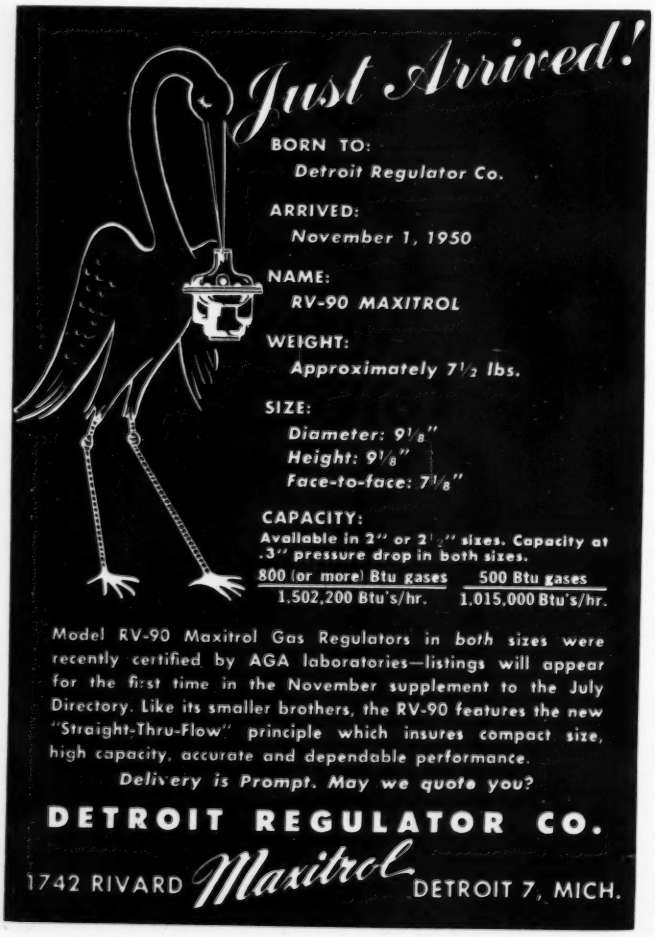
*City*_____

HY-21A

HYDRAUGER*

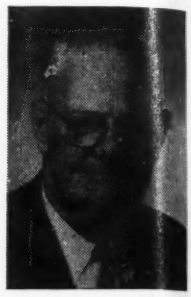
Earth Boring Tool

**Reg. U. S. Pat. Off.*


Just Arrived!
BORN TO:
Detroit Regulator Co.
ARRIVED:
November 1, 1950
NAME:
RV-90 MAXITROL
WEIGHT:
Approximately 7½ lbs.
SIZE:
Diameter: 9⅛"
Height: 9⅛"
Face-to-face: 7⅛"
CAPACITY:
Available in 2" or 2½" sizes. Capacity at .3" pressure drop in both sizes.
800 (or more) Btu gases 1,502,200 Btu's/hr.
500 Btu gases 1,015,000 Btu's/hr.
Model RV-90 Maxitrol Gas Regulators in both sizes were recently certified by AGA laboratories—listings will appear for the first time in the November supplement to the July Directory. Like its smaller brothers, the RV-90 features the new "Straight-Thru-Flow" principle which insures compact size, high capacity, accurate and dependable performance.
Delivery is Prompt. May we quote you?
DETROIT REGULATOR CO.
1742 RIVARD Maxitrol DETROIT 7, MICH.

Two executives of Ohio Fuel Gas Co., Columbus, have been named vice presidents of the Columbia Gas System subsidiary. They

F. S. Williams



C. C. Phillips

are FRANK S. WILLIAMS, business promotion department head, and C. C. PHILLIPS, manager of transmission and a director.

Air conditioning, refrigeration, and heating equipment which may be contracted for by the government will be handled for General Electric Co., Bloomfield, N. J., by S. A. DURBIN, recently appointed military planner, air conditioning department.

Obituaries

K. C. Tomlinson

K. C. TOMLINSON, Pacific coast manager of American Meter Co., New York, died on Nov. 13 while attending the American Petroleum Institute convention at Los Angeles. Mr. Tomlinson's gas industry career began when he became a chemist for Portland (Ore.) Gas & Coke Co. Later he became assistant manager of Pacific Meter Works, San Francisco affiliate of American Meter, and a few years ago he took over as Pacific coast manager, headquartering in San Francisco. In 1924 Mr. Tomlinson received the PCGA gold medal.

FREDERICK C. FREEMAN, 68, president of the Providence (R.I.) Gas Co. from 1930 to 1948, died Nov. 6 at a Rhode Island hospital to which he had been admitted for an operation. During his career Mr. Freeman served as president of the New England Gas Assn. and the New England Assn. of Gas Engineers and as a director of the American Gas Assn.

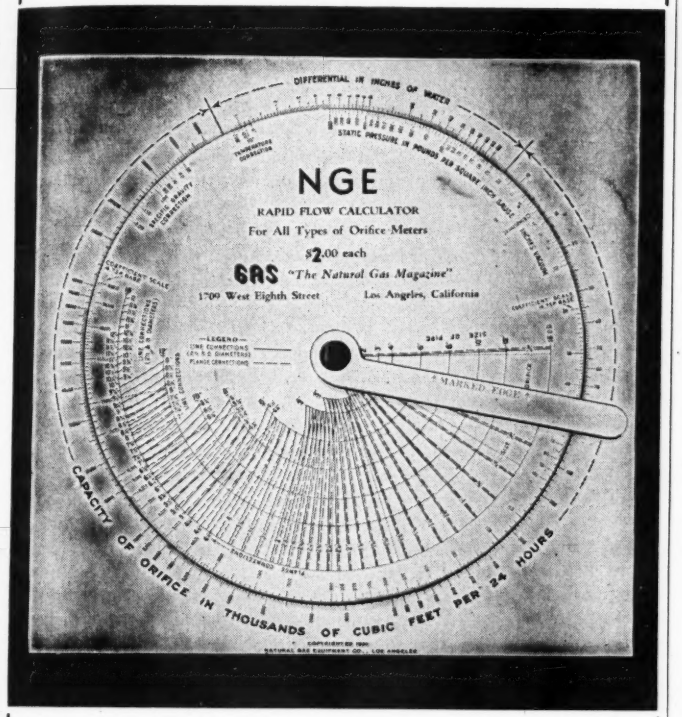
JOHN F. SHAW, vice president in charge of engineering and production for Seattle (Wash.) Gas Co., died Nov. 21. Mr. Shaw was born in Terre Haute, Ind., in 1903, was graduated from Rose Polytechnic Institute in 1928, and joined the Seattle utility in 1933. He assumed the vice presidency in 1947.

On Oct. 13 BURT C. TAYLOR, vice president and treasurer and a director of The Dayton (Ohio) Power & Light Co., died suddenly. Mr. Taylor had been employed by the company since 1911.

NGE RAPID FLOW

CALCULATOR

FROM 2 inches TO 16 inches


NGE
RAPID FLOW CALCULATOR
For All Types of Orifice Meters
$2.00 each
GAS "The Natural Gas Magazine"
1709 West Eighth Street Los Angeles, California
MARKED EDGE
CAPACITY OF ORIFICE IN THOUSANDS OF CUBIC FEET PER 24 HOURS

. . . will quickly compute any of a series of variables in the transmission of natural gases.

SIMPLE to operate: Set dial . . . Turn indicator . . *and instantly find*

1 COEFFICIENT and VOLUME
2 CORRECT ORIFICE SIZE IN ANY GIVEN VOLUME
3 DIFFERENTIAL PRESSURES

Our NGE CALCULATOR has been tested in field and desk use. Why not let it *help you* with your daily problems. If interested send in coupon and you will receive our calculator in a few days.

G A S
198 South Alvarado St.,
Los Angeles 4, California

$2.00 EACH
25% discount on all orders for 25 or more

Gentlemen: Please send me.....NGE *Gas Flow Orifice Calculators* for which I am enclosing my check or money order for $..... *Add 3% sales tax in California.*

NAME .....

COMPANY .....

ADDRESS .....

Why you will want to SPECIFY

Utility

WATER HEATER THERMOSTATS

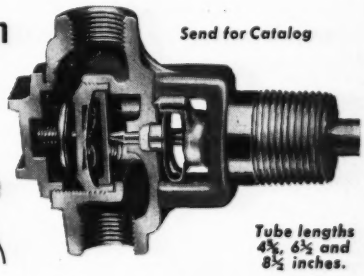
In a water heater thermostat you want ***DEPENDABILITY*** of control and long service life in order to assure customer satisfaction and long, trouble-free operation.

Of next importance is accessibility of the thermostat parts. Ask yourself this question: If service is ever required, is the unit easy to get at? We invite you to compare point for point the UTILITY with any other popular make of water heater thermostat. Compare it for simplicity of design, its few parts, and its ease of accessibility. These are the basic fundamental advantages of UTILITY and are the reasons why you will want to specify UTILITY WATER HEATER THERMOSTATS.

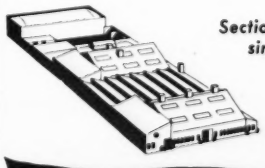
WATER HEATER MANUFACTURERS, JOBBERS AND DEALERS! Play safe and insist upon UTILITY THERMOSTATS.

- **Simple in design**
- **Ruggedly built**
- **Few parts easily accessible**
- **Certified by A.G.A.**

Send for Catalog



Tube lengths 4¾, 6½ and 8½ inches.



Sectional view through Utility Thermostat illustrates simplicity of design and rugged construction.

The Utility Control Company Factory. Twenty years' experience building gas controls.

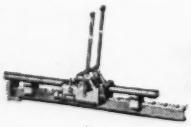
Utility CONTROL COMPANY

832 EAST 108th STREET • LOS ANGELES 59, CALIFORNIA

PUSH PIPE
UNDER STREETS, WALKS,
TRACKS, FLOORS

...with a GREENLEE PIPE PUSHER

Yes, here's the quick and simple way to install underground pipe. With a GREENLEE Hydraulic Pipe Pusher *one man* pushes pipe *under* obstacles. No tearing up of pavement, lawns, floors... eliminates extensive ditching as just a short trench accommodates the Pusher. No tedious tunneling, back-filling, tamping, or re-paving. Job time is cut to a fraction. Pusher often pays for itself through labor savings on the first job or two.



No. 790 GREENLEE PUSHER
For 3/4 to 4-inch pipe. Six Speeds—6,500 to 40,000 lbs. pushing pressure.

No. 795 GREENLEE PUSHER
For pipe larger than 4-inch, concrete sewer pipe, large drainage ducts. Six speeds—25,000 to 150,000 lbs. pushing pressure.

POWER PUMP for both sizes of GREENLEE Pushers. Pushes pipe at rate of two feet per minute.

GREENLEE
TOOLS FOR CRAFTSMEN

Get facts on timesaving Greenlee tools now. Write Greenlee Tool Co., Division of Greenlee Bro. & Co., 1952 Columbia Avenue, Rockford, Illinois, U.S.A.

ASSOCIATIONS

A. H. Forbes

Vivian Marshall

Post-Convention Activities Occupy AGA Committees

In the wake of the Atlantic City convention, new AGA committees are settling down to make plans for the coming year.

At the annual meeting of the home service committee, Miss Vivian L. Marshall, home service director of New Orleans Public Service Inc., was appointed 1950-51 chairman. The schedule of work approved by the committee includes completion of the booklet on "Home Service Aims and Organization," and work on two projects—a study of the broiler and production of laundry promotion material.

Chairman of the rate committee for the coming year is Arthur H. Forbes, rate engineer, The East Ohio Gas Co., Cleveland. Under Mr. Forbes' guidance, the committee will make studies of the various costs involved in supplying gas to customers and will recommend forms of rates designed to meet such costs.

At the convention executive session, Hudson W. Reed, Philadelphia Gas Works Co., was elected chairman of the 1951 general nominating committee. Serving with him are C. H. Gueffroy, Portland (Ore.) Gas & Coke; G. S. Hawley, Bridgeport (Conn.) Gas Light; E. C. Overbeck, Ohio Fuel Gas, Columbus; J. A. Robertshaw, Robertshaw-Fulton Controls, Greensburg, Pa.; and Gardiner Symonds, Tennessee Gas Transmission, Houston.

Shortly after the delegates left Atlantic City, a number of them congregated at Chicago's International Amphitheatre where, during the week of Oct. 23, the National Metal Congress and Exposition was held. AGA's combined industrial gas exhibit covered a 4000-sq ft area.

INGAA Delegates Consider Common Carrier Problem

The common carrier concept as applied to natural gas pipelines was given close scrutiny and a heavy barrage when members of the Independent Natural Gas Assn. of America met in Houston in late October.

Marshall Newcomb, general counsel for Lone Star Gas Co. of Dallas and a member of the four-man panel on the subject, showed its impracticability in the four following aspects:

1. A common carrier of a natural gas company could not undertake the transmission of natural gas from producers for delivery to industrial consumers and still meet its primary obligation.

2. States could not enforce proration laws and protect correlative rights because the capacity of a common-carrier natural gas pipeline might be, at a given time, completely saturated by the gas of shippers who have received prior commitments.

3. Apportionment of the supply of gas among localities and consumers could not be effectually enforced, and the shipper would designate the consumer to which his natural gas was to be transported.

4. Since the charge for transportation would probably be based on mileage, in the case of an integrated natural gas company, intricate problems of allocation would be involved which in many instances could not be rationally solved.

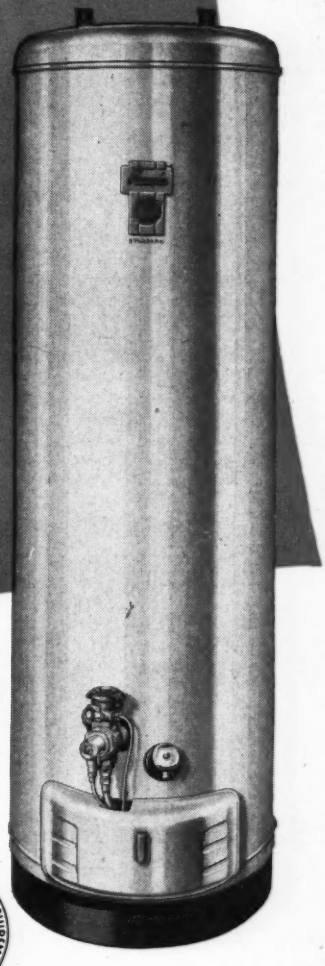
The vice chairman of the Federal Power Commission, Thomas C. Buchanan, urged the interconnection of major pipelines as a defense measure. Mr. Buchanan said an FPC study had shown that such linking could be accomplished in at least 200 points, exclusive of those possible in the congested West Virginia-Pennsylvania areas.

Paul Kayser, president of El Paso Natural Gas Co., was named new president of the association, succeeding Clyde Alexander of Dallas. C. P. Rather, Southern Natural Gas Co., Birmingham, and John F. Merriam, Northern Natural Gas, Omaha, were elected vice presidents. Fred Peters, Oklahoma Natural, Tulsa, stays on as treasurer.

THE TRADITIONAL HANDSHAKE is extended by Clyde Alexander as he relinquishes the presidency of the Independent Natural Gas Assn. of America to his successor, Paul Kayser (right) during the association's convention in Houston.

NEW MODELS! New Low Prices!

Guaranteed by Good Housekeeping



A. O. SMITH

Permaglas

TRADE MARK REG. U. S. PAT. OFF.

AUTOMATIC GAS WATER HEATERS

GAS APPLIANCE MANUFACTURERS ASSOCIATION — AUTOMATIC GAS — COURT OF FLAME — SYMBOL OF QUALITY

AMERICAN GAS ASSOCIATION — COMPLIES WITH NATIONAL SAFETY REQUIREMENTS — APPROVED

Now Cost No More Than Ordinary Water Heaters

Mass production savings make possible these new low prices! Shipment of more than a million water heaters from A. O. Smith's huge Kankakee works shows that public acceptance and unprecedented demand have made *Permaglas America's largest selling* top-quality water heater.

Why? Because more and more prospects want lasting freedom from tank-rust. In short, they want *Permaglas* with the glass-surfaced steel tank that can't rust because GLASS CAN'T RUST.

Gas Has Got It for water heating! And the new A. O. Smith *Permaglas* Automatic Gas Water Heater has everything it takes to help the gas utility get and hold this desirable load. Here is ONE water heater that is designed to end servicing headaches.

With its glass-surfaced steel tank and exclusive *CERAMITRON* construction, it gives complete freedom from tank-rust. Burners are glass-surfaced to eliminate rust or corrosion damage—*every* feature is built to keep your servicing costs down—your profit per installation UP!

Get all the details about A. O. Smith's BIG gas water heater news—fill out the coupon and mail it today.

A.O.Smith

A.O.Smith

AUTOMATIC WATER HEATERS

Atlanta 3 • Boston 16 • Chicago 4 • Dallas 2 • Denver 2
Detroit 2 • Houston 2 • Los Angeles 12 • Midland 5, Texas
Milwaukee 2 • New York 17 • Philadelphia 3 • Phoenix
Pittsburgh 19 • Salt Lake City 1 • San Diego 1 • San Francisco 4
Seattle 1 • Tulsa 3 • Washington 6, D.C. • International Division:
Milwaukee 1 • *Licensee in Canada: John Inglis Co., Ltd.*

CLIP...MAIL TODAY!

A. O. Smith Corporation
Water Heater Division, Dept. G-1250
Kankakee, Illinois

Send me complete information about the new models and new low prices of *Permaglas* Automatic Gas Water Heaters.

Name_____

Firm_____

Address_____

City_____ Zone_____ State_____

CALENDAR

DECEMBER

The American Society of Refrigeration Engineers—Hotel Commodore, New York, Dec. 3-6.

Institute of Cooking and Heating Appliance Manufacturers Semi-Annual Meeting—Cincinnati, Dec. 4-6.

JANUARY 1951

AGA Home Service Workshop—Hotel Statler, Washington, D. C., Jan. 3-5.

Pipe Line Contractors Assn. Annual Convention—Shamrock hotel, Houston, Jan. 9-10.

American Society of Heating & Ventilating Engineers—Philadelphia, Jan. 22-25.

MARCH

Mid-West Gas Assn.—Hotel Fontenelle, Omaha, March 12-14.

National Assn. of Corrosion Engineers Conference & Exhibition—Hotel Statler, New York, March 13-16.

New England Gas Assn. Annual Meeting—Hotel Statler, Boston, March 29-30.

APRIL

AGA Sales Conference on Industrial & Commercial Gas — Shoreham hotel, Washington, D.C., April 2-4.

Mid-West Regional Gas Sales Conference, Residential Gas Section—Edgewater Beach hotel, Chicago, April 9-11.

Southwestern Gas Measurement Short Course—University of Oklahoma, Norman, April 10-12.

AGA Distribution, Motor Vehicle, and Corrosion Conference—Hotel Peabody, Memphis, April 16-18.

Gas Appliance Manufacturers Assn. Annual Meeting—The Drake hotel, Chicago, April 16-18.

Southern Gas Assn. Annual Meeting—Biloxi, April 23-25.

National Conference of Electric and Gas Utility Accountants—Hotel Sherman, Chicago, April 23-25.

Indiana Gas Assn. — French Lick Springs, French Lick, Ind., April 26-27.

MAY

AGA Natural Gas Department Spring Meeting—Baker hotel, Dallas, May 7-8.

Missouri Assn. of Public Utilities—Jefferson hotel, St. Louis, May 7-9.

National Resturant Exposition—Navy Pier, Chicago, May 7-11.

AGA Production and Chemical Conference—Hotel New Yorker, New York, May 14-16.

AGA Industrial and Commercial Gas Section Industrial Gas School—William Penn hotel, Pittsburgh, May 14-18.

Pennsylvania Gas Assn.—Wernersville, Pa., May 15-17.

Public Utilities Advertising Assn. Convention—Hotel New Yorker, New York, May 17-19.

JUNE

Institute of Cooking and Heating Appliance Manufacturers Annual Meeting—Cincinnati, June 5-6.

AGA Executive Conference—Greenbrier hotel, White Sulphur Springs, W. Va., June 11-12.

Canadian Gas Assn.—Bigwin Inn, Lake of Bays, Ontario, Canada, June 18-21.

Michigan Gas Assn.—Grand hotel, Mackinac Island, Mich., June 25-26.

SEPTEMBER

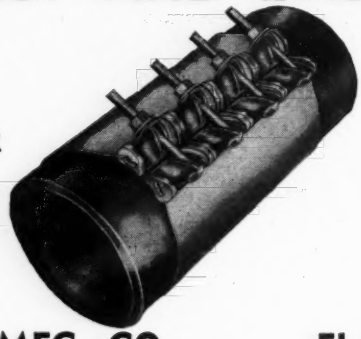
Pacific Coast Gas Assn. Annual Convention — Fairmont hotel, San Francisco, Sept. 4-6.

OCTOBER

AGA Annual Convention—St. Louis, Oct. 15-18.

THE FAST AND EASY WAY!

STAUFFER PIPE REPAIR CLAMPS



to Permanent PIPE REPAIR

STAUFFER MFG. CO. El Monte, Calif.

IRON SPONGE

for high efficiency gas purification at high pressures

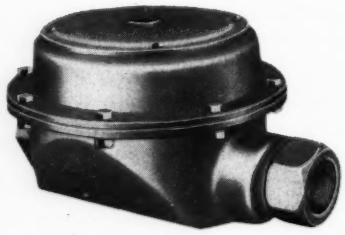
Iron Sponge is your key to sulfur-free gas at minimum processing cost. Iron Sponge has high efficiency at low pressures or at today's high pressures and high temperatures. It absorbs *more* H_2S, gives long service between foulings, and is easily regenerated. Investigate it for your purification problem today!

CONNELLY Inc.

3154 S. California Ave., Chicago 8, Ill.
Elizabeth, N. J. • Los Angeles, Calif.

Investigate!

NORWALK SUPERIOR SERVICE REGULATION



Leading utilities throughout the country are specifying Norwalk lever connected service regulators, either spring or weight loaded.

Send for bulletin 7500M. Why not also send us your specifications or tell us your problem? Our products can assure you accurate, troublefree regulation for years to come.

NORWALK VALVE CO.
South Norwalk, Conn.

Manufacturers of Norwalk-Connelly Regulators since 1878

Wisconsin Utility Men Meet

Buzzing with problems on natural gas and eager to exchange ideas on how to utilize it more satisfactorily, 568 gas and electric utility men gathered Nov. 8-10 in Milwaukee for the combination convention of the electric and gas sections of the Wisconsin Utilities Assn.

J. C. Bolender

The experience of Detroit in overhauling its distribution system to handle new heating peaks, the exchange of thoughts and theories on odorization, and the solemn warning of Irving K. Peck, vice president of Manufacturers Light & Heat, Pittsburgh, against overoptimism in the light of the advent of natural gas were program highlights.

Heading the panel of incoming gas officers elected at the convention was John C. Bolender, assistant to the vice president, Milwaukee Gas Light, named chairman of the technical division of the gas section. He succeeds G. G. Ellerbrock, Oshkosh.

Albert Smith, Northern States Power Co., Chippewa Falls, was elected vice chairman.

A. G. Bur, Wisconsin Public Service Corp., Green Bay, took over chairmanship of the sales and service division of the gas section. J. H. Mikula, Milwaukee, was elected vice chairman.

CURRENT READING

BUREAU OF MINES REPORTS OF INVESTIGATIONS—Three new reports are available from the Bureau of Mines, Publications Distribution Section, 4800 Forbes St., Pittsburgh 13, Pa. They are No. 4716, "Effect of Oil-Base Drilling Fluid Filtrate on Analysis of Cores from South Coles Levee, Calif., and Rangely, Colo., Fields"; No. 4714, "Use of Explosives in Oil and Gas Wells—1949 Test Results"; and No. 4698, "Petroleum-Engineering Study of the Carthage Gas Field, Panola County, Texas."

WATER SIDE DETERIORATION of Diesel Engine Cylinder Liners—by F. N. Speller and F. L. LaQue, reprinted from *Corrosion* by The International Nickel Co. Inc., 67 Wall St., New York. The authors describe a peculiar form of corrosion sometimes occurring in the cylinder liners of diesel engines, including those employed in gas engines used in pumping or compressor stations on cross country gas pipelines.

AMERICAN STANDARD COMPRESSED Gas Cylinder Outlet and Inlet Connections, B57.1-1950—Available from the American Standards Assn., 70 E. 45th St., New York 17, or from the Compressed Gas Assn., 11 W. 42nd St., New York 18, at $1.50 a copy. The standard recommends detailed dimensions for all elements of valve outlets of compressed gas clyinders and their connections.

Peerless GAS CIRCULATORS

Radiant and plain front fully vented models.

20,000 to 60,000 B.T.U. sizes.

Manual or Automatic Controls.

NEW Silver-Tan finish.

NEW Seam Welded gas tight heating sections.

A. G. A. Approved.

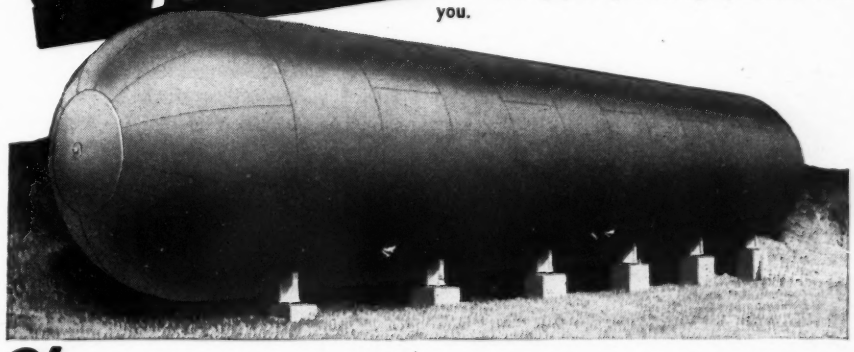
Forced air and gravity, Gas Circulators — Unit Heaters — Panel Heaters — Wall Heaters — Radiant Heaters.

Write NOW for complete NEW literature on the line that sells.

PEERLESS MANUFACTURING CORP, LOUISVILLE 10, KY.

STAMANCO HI-PRESSURE TANKS

Made in both horizontal and vertical types for storing all types of gases under pressure, STAMANCO Hi-Pressure Tanks are soundly engineered and ruggedly built to give long dependable service. All-welded or riveted construction. We would appreciate the opportunity of discussing your gas storage problems with you.



The STACEY MANUFACTURING Co.
SINCE 1851
CINCINNATI 16, OHIO

GAS HOLDERS • HI-PRESSURE TANKS • PURIFIER BOXES

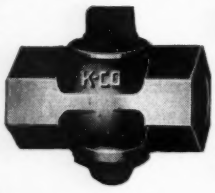
ENGINEERS • FABRICATORS • CONSTRUCTORS

An Independent Organization Not Affiliated With Any Other Builders of Gas Holders

Sound design, dependable service have established this organization's leadership in the plumbing field for 75 years. WELSBACH-Kitson products are your guarantee of *quality, dependability and reliability.* Shown here are only a few of the many items available. Write for the complete WELSBACH-Kitson catalog.

G-501

Flat head iron body service pattern with BRASS plug. Sizes: ½"-¾"-1"-1¼" -1½"-2"



G-501R

BRASS plug with flat head-key and recessed ends. Sizes: ¾"-1"-1¼"-1½"-2"

G-515

BRASS plug with lock wing. Sizes: ¾"-1"-1¼"-1½"-2"

G-519

Same as G-515 with lock wing H. P. Size: ¾"

THE
WELSBACH
CORPORATION
KITSON DIVISION
1500 Walnut Street
Philadelphia 2, Pa.

TENTATIVE STANDARD PROCEDURE for the Determination of Carbon Dioxide and Oxygen in Natural Gases—Designated Bulletin TS-501, this publication is available from the California Natural Gasoline Assn., 510 W. 6th St., Los Angeles 14, Calif. It is intended as an operating manual for the analyst in the laboratory and in the field. Price for CNGA members is $2; for non-members, $2.50.

FACTS ABOUT OIL—Published by the Department of Information, American Petroleum Institute, 50 W. 50th St., New York 20. Quantities for company and trade association distribution are available at $6 per 100. The 32-page booklet is an informative summary intended for use as reference and background.

GALVANIC CORROSION OF DISSIMILAR METALS as Appied to Gas Hot Water Storage Heaters, Part III—by Dr. Robert C. Weast, Case Institute of Technology. Sponsored by the AGA committee on domestic gas research, this report is available from American Gas Assn. headquarters for 50 cents. It is the third publication covering results of galvanic corrosion research conducted at Case. Conclusions presented in the report are printed here:

A. The obvious solution to this galvanic corrosion problem in hot water storage tanks is to avoid construction of installations composed of two dissimilar metals. This is particularly true when one of the metals is either black iron or galvanized steel. However, when due to structural, economic or other reasons, the use of dissimilar metals cannot be avoided it is usually possible to reduce galvanic corrosion by some of the following methods:
   1. Use insulating couplings, unions, nipples or gaskets to separate the metals. This type of construction has been shown to be satisfactory in stopping galvanic corrosion in the following bimetallic system: black iron, galvanized steel; Monel, galvanized steel; and copper, galvanized steel. It is to be pointed out that dielectric materials are not effective in stopping galvanic corrosion when water of a high copper solvency is being heated in a galvanized steel-copper system and if the water flows first through the copper and then through the galvanized steel container. This inability of dielectric materials to stop corrosion in this case results from copper being attacked by the ammonium compounds and carbon dioxide in the water. The attack causes formation of copper ions which are carried along by the flowing water into the galvanized steel tank. In the tank some of these copper ions come in contact with the zinc coated tank wall. These copper ions are then electrochemically deposited on the tank wall as metallic copper. Hence, the tank becomes spotted with numerous small galvanic cells. This observation is not original with the present investigators, for it has been previously observed by others, particularly by Kenworthy[1] in England. Kenworthy noticed that if the water were one which corroded copper, as do waters which contain ammonia or aggressive carbon dioxide, premature failure of the galvanized steel is almost certain to occur, if there is copper in the system. He suggests as remedies reduction of the cuprisolvency by addition of lime or passing the water over zinc turnings prior to its entering the galvanized container. It should be understood that these are not the only methods for combatting corrosion of this type. And it is hoped that some of the methods suggested in this report such as use of sacrificial magnesium anodes or addition of sufficient polyphosphates to reduce the deleterious effect of this copper carry-over from the pipes will prove practical and helpful.

      It has been pointed out by the brass industry that brass is attacked less by natural waters than is copper. Results of the present research indicate that there is less copper carry-over from the brass pipe than from the copper. However, there was sufficient copper dissolved from the brass by the waters used in this research to prove harmful to galvanized steel tanks.
   2. Install a sacrificial magnesium anode. This has been shown to be beneficial in galvanized steel tanks when such tanks were connected to brass, copper, or black iron pipes. The sacrificial magnesium anode was also found to be beneficial in vitreous enameled tanks which had been damaged intentionally to produce cracks and defects in the enamel coating, and which had been connected to brass or copper pipes.
   3. Treat the water with approximately 150 ppm phosphate of a type known to be a corrosion inhibitor. This was found to be effective in reducing corrosion in the small tanks when either black iron, brass or copper were coupled to galvanized steel.

B. It was concluded not to be possible to evaluate accurately the extent and severity of galvanic corrosion in hot water storage tank systems from change in water composition because the general corrosion of the tank or pipe alters the chemical composition to an extent greater than that caused by galvanic corrosion.

C. The extent and severity of galvanic corrosion at the end of one year's test was approximately the same for unsoftened and zeolite softened Cleveland water.

D. Galvanic corrosion is not a problem in hot water storage systems if the water has a very low total dissolved solids content. (The low solids content waters used for the present tests were distilled water and distilled water plus 50 ppm free carbon dioxide.)

E. Chemical analysis of the water is better than visual inspection of the tank if the water is very low in total solids and if general tank corrosion is being investigated.

It was for these reasons that the present research was undertaken to try to evaluate some conditions under which galvanic corrosion is a severe problem to the gas water heating industry and further to try to find methods for safe reduction or elimination of this corrosion.

[1] L. Kenworthy, J. Inst. Metals, *69*, 67 (1943).

PLANNING A CORROSION CONTROL PROGRAM: V

Cathodic Protection of New Lines and Systems

By H. S. Riddle
Columbia Engineering Corp.
Columbus, Ohio

THE best pipeline coatings available are subject to holidays, damage during installation and backfilling, soil stress, damage from installation of other underground structures. Even though a pipecoating may be made perfect over the trench, after installation and over a number of years in the ground numerous breaks in the coating will develop. It would be almost impossible, and probably very costly, to periodically locate all coating breaks which develop and repair them.

In corrosive soils, corrosion leaks develop in a few years at breaks in the coating. Frequently the first corrosion leaks will develop at breaks in coated pipe in two-thirds the time that the first corrosion leaks develop on bare pipe in the same soil. This is especially so where lines are subjected to stray railway direct current.

Cost 1% of System

Cathodic protection on new, well-coated mains and services is so minor in cost, when installed at the same time the pipes are laid, that it seems desirable and economical to apply protection to all new extensions. On some new distribution systems installed recently, the total cost of cathodic protection was about 1% of the total cost of the system. This provides very low cost insurance against corrosion for scores of years, and long life with very low maintenance costs. Fortunately the operation and maintenance of the cathodic protection would be very low also.

The use of cathodic protection on new extensions and systems could result in a saving of total cost, as thinner wall pipe may be used. One gas distribution company in Mississippi reported in a paper presented at the National Assn. of Corrosion Engineers meeting in 1949, that an average saving of 20% in weight of pipe is now being realized. This should more than offset the small cost of cathodic protection.

Invasion Pipe Use Possible

The Mississippi company also installed a 30-mile gas transmission line using coated, thin-wall invasion pipe, with full confidence that no corrosion failure will occur as long as the cathodic protection which was installed is operated and maintained properly. The soil along most of the line is very corrosive. The use of the thin-wall pipe would not have been considered without cathodic protection to guard against corrosion.

If all new lines are installed with cathodic protection, and cathodic protection is expanded on existing lines, corrosion failures and the high cost of corrosion can be reduced materially within a few years.

Nationally Advertised!
Now! *White* WATER-HOTTERS for all gas including L-P are nationally advertised in leading publications such as *Saturday Evening Post, Good Housekeeping* and *Better Homes & Gardens*— to win your prospects' instant acceptance of these new and better Automatic Gas Water Heaters.

White
WATER-HOTTER
Automatic
GAS WATER HEATERS

WHITE PRODUCTS CORPORATION
Water Heating Specialists Since 1930
Middleville, Michigan

You make more money because WHITE moves faster!

Quick turnover—that's the answer to today's profit-problems. Don't let a dollar stand on your floor, tied up in merchandise, one minute longer than necessary! Handle the nationally advertised *White* line and enjoy the benefit of fast moving, quick turning money makers. Contact your *White* distributor, or *White* direct, At ONCE! Get the Proved Profit story by White without delay.

Patented, Copyright 1950 White Products Corp.

CLIP THIS AND MAIL TODAY

IF YOU ARE NOT A REGULAR SUBSCRIBER TO GAS

In GAS each month you will find dozens of ideas that will help you know your business better and do your job better. Just one of these ideas coming to you on our pages can pay you many, many times the small cost of a subscription.

GAS 198 SOUTH ALVARADO ST.
LOS ANGELES 4, CALIFORNIA

Standard rates apply to U. S. and Possessions, Canada, Mexico, Cuba, South and Central American Countries.
All Others—1 Year $3 ☐

Please enter my subscription to GAS for . . .

1 YEAR $2.00 ☐ 2 YEARS $3.50 ☐ 3 YEARS $5.00 ☐

☐ Check is enclosed ☐ Please bill me

COMPANY_____

NAME_____ POSITION_____

STREET CITY ZONE STATE

Install Protection on Existing Lines

By M. C. Miller
Ebasco Services Inc., New York

ON many of the older gas distribution systems, in areas where the soil is corrosive, corrosion has gotten a head start, especially on bare and poorly coated steel mains and services. Corrosion leakage on these older existing lines may be causing a large percentage of gas losses and be responsible for heavy operation, maintenance and replacement costs. This is the case on some systems where soil conditions are classed as more corrosive than average.

It is on these older, bare and poorly coated steel lines in corrosive soils where the largest immediate return for the money spent on cathodic protection can be realized. Often a few dollars spent on cathodic protection can avoid the replacement of mains which otherwise would be considered essential—with a sizeable saving in cash outlay. Mr. Simpson (*GAS*, Aug. 1950, p. 80) has mentioned such cases on his systems.

Protection of the older mains to halt further corrosion primarily to reduce gas losses and leak location and repair costs has been found to result in large returns for the money so spent. Mr. Morgan (*GAS*, Aug. 1950, p. 81) mentions a return of 30%.

Of course, location and repair of all existing leaks coincident with the application of cathodic protection is essential, and the cost of locating and repairing such leaks is usually included as part of the cost of applying cathodic protection to such lines.

Experiences on numerous systems have shown conclusively that cathodic protection properly applied and operated will stop further corrosion.

Cathodic protection of bare mains and services, especially in highly congested areas such as on gas distribution systems presents numerous problems, and in some cases the use of cathodic protection may not be practical for bare mains and services. Proper design requires careful engineering, installation and operation to obtain the desired results without interference to other structures.

Various methods have been used. In an outlying area of Houston, a section of bare 8-in. line is under protection using zinc anodes well distributed. The section protected is insulated from all other structures to reduce the magnitude of current required.

In Arkansas, a number of complete gas distribution systems in relatively small towns using bare mains and services have been put under protection utilizing a number of small, well-distributed rectifiers. In some cases the gas system has been insulated from the water system by installing insulating couplings in all meter loops and clearing all accidental contacts. Resistance bonds were installed where needed to avoid damage to water system piping. The water systems usually are cast-iron, and because of the resistance of the joints, the bond current may be only 15% to 20% of the total current supplied. This current collected on the water system provides a small measure of protection.

The gas system, consisting largely of bare pipes, in a number of the small towns was put under protection utilizing rectifiers well spread out, but protecting *all* buried structures as a unit. In those cases the money, which would be spent on insulating the gas system from other buried structures, was spent instead on additional rectifiers and ground beds. Where the cost of power is low, this is a desirable method.

In one large city—Miami, Fla.—all of the underground structures in the business district, including gas and water systems, communication and electric cables, were put under cathodic protection as a unit. This was done on a cooperative basis.

Cathodic protection of the older, poorly coated gas lines is far less difficult than of the bare lines, because the current required is relatively small. Although the coating may be badly deteriorated, and numerous corrosion leaks have developed, installation of cathodic protection may be a relatively simple problem even in highly congested areas such as a business district of a city. By electrically insulating the lines to be protected from other structures, the potential-to-earth can be changed. The small amount of current required reduces the problem of avoiding interference with other lines. Well distributed anodes work well for such lines.

One of the major problems and costs involved in applying cathodic protection to either the bare or the poorly coated gas distribution systems is the locating and bonding of Dresser couplings which were installed originally or installed in connection with replacements of sections, or for connection of taps or new extensions. If cathodic protection of the older steel lines is contemplated some time in the future, a policy should be set up as how such installations should be made from now on to avoid large expenses at a later date. Mr. Peabody discussed desirability of reviewing construction and maintenance practices. When and where to use Dresser couplings and whether they should be bonded should be included. The longer you delay in getting this phase of the work set up and put into effect, the more expensive will be the application.

I certainly agree with Mr. Riddle that, as a general policy, cathodic protection should be installed on all new lines in corrosive areas. Many firms now have that policy.

But for ultimate economy and benefits it is necessary also to work backward, so to speak, and endeavor to do what should have been done many years ago.

IN THIS, the final installment in the five-part symposium, "Planning a Corrosion Control Program," Mr. Riddle and Mr. Miller consider the advantages of installing cathodic protection on new and existing lines. Mr. Miller, who organized and sparked the symposium, reviews in brief some of the points brought out in the first four installments.

M. C. Miller

This series began with the August 1950 issue. First in the initial installment was an analysis of procedures, followed by a study of actual corrosion costs on a system. The necessity for and methods of selling management and workmen on its value were considered next, followed by an explanation of how a utility should cooperate with other underground operators.

In the second installment, a strong case was made for advance planning for adequate operation and maintenance, and a table of personnel organization was presented.

In October, tips on selecting instruments and things to watch for in putting a program to work were discussed. Last month's installment urged the review of maintenance standards and practice to avoid conflict, and listed factors to consider in choosing between galvanic anodes and rectifiers.

GAS CLASSIFIED

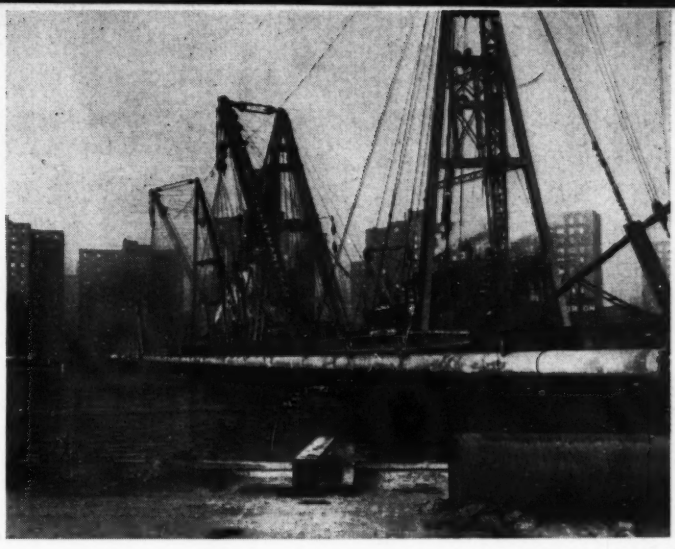
Classified advertising is set in 6-point type, without border or display, at the rate of 15 cents per word per insertion; minimum charge per insertion $3. Box numbers for replies count as 5 words. Count as a word each one letter word and each group of figures. Classified advertising is only accepted when payment accompanies order. Copy and payment must reach publisher's office prior to 10th of month preceding publication.

REPRESENTATION WANTED: SALES REPRESENtative wanted to sell gas valves, filters, pressure regulators, etc. to gas companies, manufacturers and jobbers. Write in confidence stating companies now represented, territory covered, and references. Gas & Oil Industry Laboratory, Irvington 11, New Jersey.

GAS ENGINEER . . . SEVEN YEARS VARIED experience in the gas business, operation, maintenance and management of smaller gas properties. Contemplating marriage and settling down and desires to become associated with large gas utility in an operating capacity. Currently employed. Veteran. Draft proof. Box 350, GAS Magazine, 198 S. Alvarado St., Los Angeles 4, Calif.

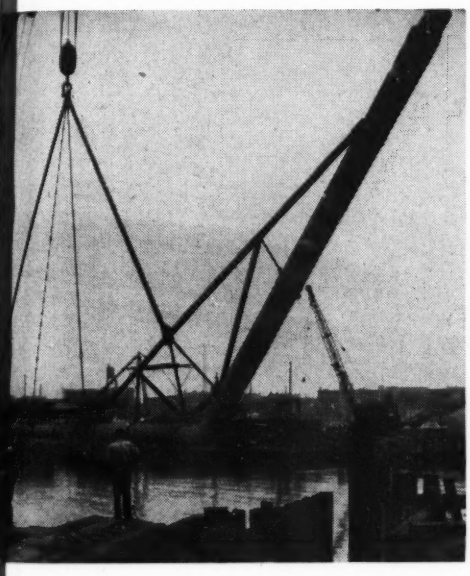
DEPENDABLE L-P GAS
FUEL SUPPLY
EQUIPMENT
ENGINEERING
CONSULTING SERVICE
UNITED PETROLEUM GAS COMPANY
806 Andrus Building · Minneapolis 2, Minnesota

Contractors • Engineers • Consultants
LP-GAS SPECIALISTS
H. EMERSON THOMAS & ASSOCIATES, INC.
P. O. BOX 270, WESTFIELD, N. J.
TEL. 2-2800
Experience • Service • Reliability

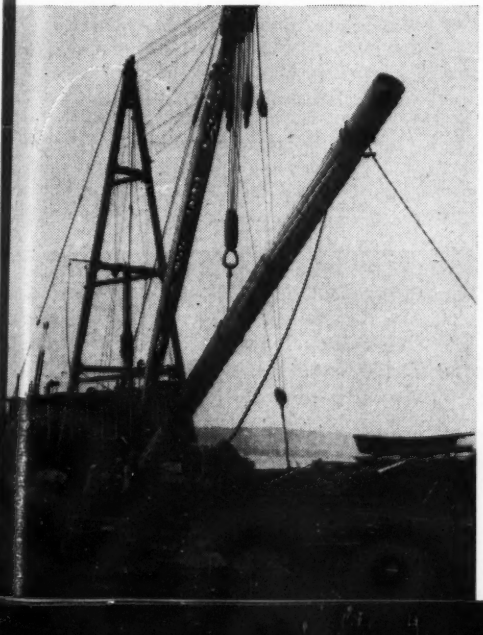


NEW JERSEY end of Transcontinental's Hudson river crossing is shown at left. Manhattan terminus of under-river crossing is almost a mile away. **ABOVE,** Consolidated Edison of New York Inc.'s crossing of the Harlem river. Derricks lower 580-ft length of 30-in. pipe into river.

BROOKLYN UNION crossing of Newton creek is under construction in picture below. Strongback and angle supports of pipeline are shown.



FINAL SECTION of Hudson river crossing is being constructed at Manhattan terminus at 134th St. in photo below.



(Continued from Page 73)

metering pier at 134th St., Manhattan. Omaha Dredge & Dock Co., with Louis I. Pentzien as general manager, subcontracted the Hudson crossing task.

Preparations for getting the pipe across the barrier formed by the Hudson began early this year. At first, plans called for a high-pressure jetting of the river bottom to form a trench for the pipeline. This method was abandoned, however, when it was learned that the bottom was formed of tightly compacted silt that stoutly resisted the jetting process. Instead, a 25-ft trench, 30-50 ft wide, was dredged for the pipe.

Into this trench, the pipe was laid in a modification of the traditional practice of welding a complete length of pipe and pulling it across the river. At this Hudson crossing, the point of departure was very near the palisades, so an apron of earth big enough to handle 300-ft lengths had to be laid at the river's edge. From a welding yard a half-mile upstream from the crossing point, the 300-ft lengths were floated down to this apron, then unloaded onto dollies mounted on two sets of parallel rails.

Push and Pull

Several barges steadied by a tugboat supported the first section of pipeline as successive lengths were moved down to the river. As the flotilla moved out into the Hudson, a second support was afforded by a giant sling mounted on offshore pilings. A 35-ton line pull was exerted on the pipe by four winches located under the West Side highway; and a winch-and-pulley arrangement on the Jersey side added a "push" force. This crossing method accounted for an average of 600 ft of pipe, welded (five passes), X-rayed, and pulled into the river, every 24 hours during a week-long period.

The New York end of the pipe was bent to conform with the main channel profile. It is inserted into a cofferdam on the Manhattan side, the Transcon mainline in Jersey has been connected with the river-crossing segment, and New York is ready for natural gas.

In getting ready for such receipt, the local distributing companies spent about $14 million in 25 miles of new natural gas pipeline, ranging in size from 12- to 30-in. Deliveries to the city from the Transcon line, which has a total capacity of 505 MMcf daily, will be 251 MMcf per day initially.

Transcon's System

The Transcon line from Texas is costing the company about $240 million. Kaiser Steel Corp. (Fontana, Calif.) was the major steel supplier on the job, and the 30-in. pipe was fabricated by Consolidated Western Steel Corp., a U. S. Steel subsidiary in Maywood, Calif. Of course, all of the pipe for the job was transported across the country from its west coast source.

General supervisor of construction was Fish Constructors, an organization founded for the big job by Fish Engineering Corp., Houston. Sub-contractors handled specific spreads, river crossings, and compressor station jobs.

The entire line, which will tap 34 gas fields along 600 miles of Gulf coast in Louisiana and Texas, must be completed by April 1, 1951, under terms of the FPC certificate held by Transcon. The section of line to Mercedes, Texas, will be finished after Jan. 1.

Above: Five of the fifteen Cooper-Bessemer GMW engine-driven compressors in Michigan-Wisconsin Pipe Line Company's Guymon-Hugoton Station, showing units from scavenging blower end. Each has 10 power cylinders and drives 3 compressor cylinders.

Right: Five GMW's in Transcontinental's Saint Francisville Station.

Extreme Right: Two of four GMW's in Panhandle Eastern's Liberal, Kansas Station.

ANGLE

Compressors

New York Washington Bradford, Pa. Parkersburg, W. Va. San Francisco, Cal. Seattle, Wa

efficient COMPRESSOR

MAYBE you've been thinking about compressor sizes and types you'll be needing for jobs ahead. You are aware that new developments in the oil and gas industry require you to study carefully the advantages and disadvantages of all types of equipment. Of one thing you can be sure . . . the GMW compressor unit (a recent development in itself) takes *full* advantage of the biggest strides made in gas engine performance. So in your planning weigh and compare these significant facts:

FUEL EFFICIENCY

1. The GMW is the only gas engine that guarantees fuel consumption of 7500 BTU's per BHP/hr. This means that the fuel you save operating these engines is delivered to the consumer . . . additional profit for you!

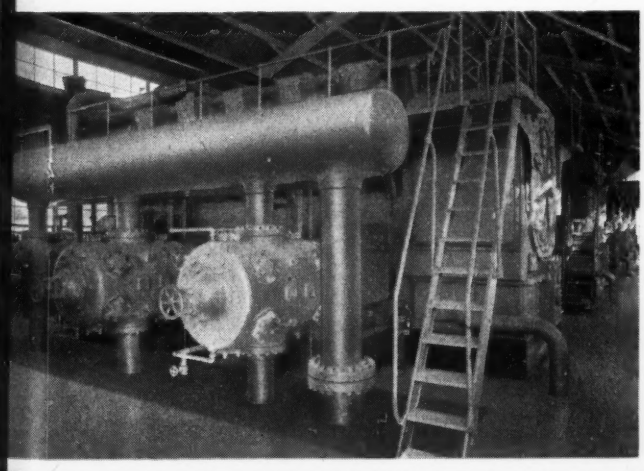
INSTALLATION EFFICIENCY

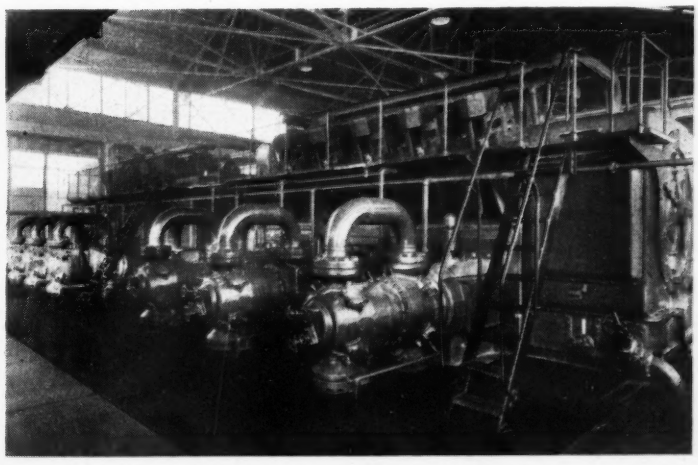
2. On installation, piping, housing, over-all operation, and maintenance you can save plenty with the GMW the largest angle compressor built. It offers the lowest *space-to-power* ratio of any gas engine driven compressor unit today, necessitating fewer units on gas transmission lines.

SMALLER COOLING TOWERS

3. Extra savings, big ones, are assured on the cost and installation of cooling equipment and piping alone, *because the GMW has the lowest heat dissipation of any gas engine compressor unit on the market today!*

These are just a few of the *major* economies you'll gain with modern, long-lived, low-maintenance GMW's. If your plans call for compressor power from 1500 bhp up, get *all* the facts . . . ask the nearest Cooper-Bessemer office to give you specific performance figures and estimated savings based on your particular requirements.





by **Cooper-Bessemer**

MOUNT VERNON, OHIO AND GROVE CITY, PENNA.

ouston, Dallas, Greggton, Pampa and Odessa, Texas Tulsa Shreveport St. Louis Los Angeles

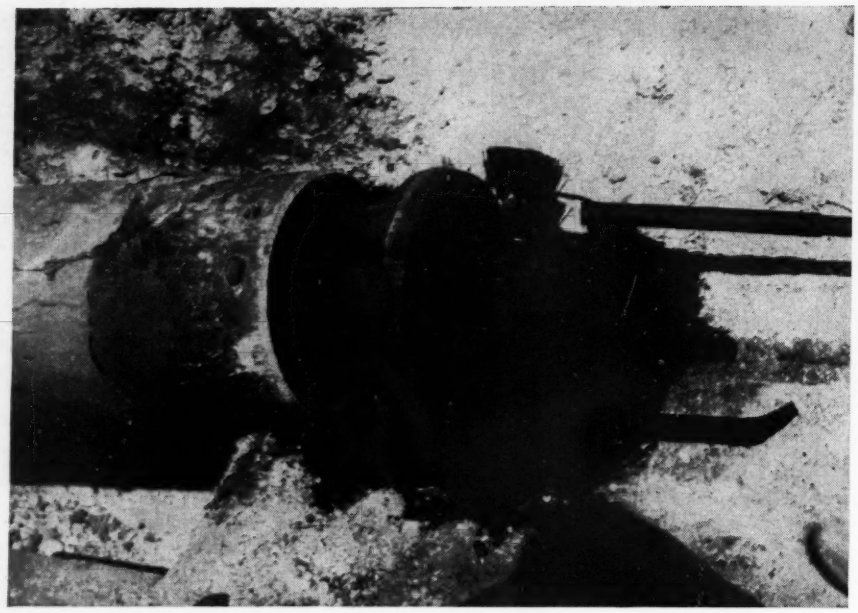


Fig. 1. Dirt and old crowbar were pulled from blow-off trap with 16-in. model WC-21 Williamson pig.

EXCLUSIVE

How Southern Counties Scraped Its Goleta No. 44 Line

By LEONARD E. POPP

The Los Angeles utility saved $21,750 per Mcf per day by internal scraping of the line, under the cost of laying a new, parallel line to increase delivery capacity—and the author thinks even more savings are possible.

THE first internal scraping of transmission pipeline in the Southern Counties Gas Co. system was carried on in the fall of 1949. The line cleaned was the 16-in. Goleta No. 44 line which is an all-welded steel line approximately 35 miles long and runs from the underground storage fields near Goleta (north of Santa Barbara) to Ventura, Calif.

Internal cleaning of pipelines with gas propelled scrapers, commonly called "pigs" or "go-devils," is a relatively new approach to the problem of maintaining a pipeline's efficiency. Records show that during 1935 to 1938 pigs were first being adapted for use in cleaning natural gas pipelines. For many years before that, however, go-devils of various designs had been used to scrape oil, gasoline, and water lines.

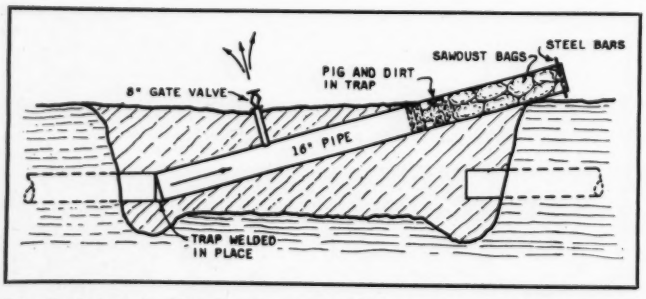
Efficiency tests were first made on the Goleta No. 44 line immediately after its completion early in 1945. The overall average of efficiency at that time was close to if not greater than the design efficiency of 85% (Nikuradse's friction factor for theoretically smooth pipe being taken as 100%). This design efficiency factor used by Southern Counties takes into account the effect that turns, bends, and main line valves have on line capacity, as well as the effect of the natural internal roughness of commercial pipe.

Subsequent tests (made since 1945) showed that the average efficiency of the line gradually declined. During the four-year period of 1945 to 1949, it continued to drop to an average of 69% in the middle of 1949. This drop of flow efficiency, amounting to about 18%, was serious enough to warrant the investigation and carrying through of an internal cleaning program.

A complete detailed record of a line's construction is essential in planning such a job, not only from the standpoint of operation scheduling, but also in securing the proper type pig.

The feature which governed the choice of pig for this line was the line's many 90°, 1½-radius welding ells, which the pig had to traverse. Although

Mr. Popp is assistant engineer, Southern Counties Gas Co., Los Angeles.



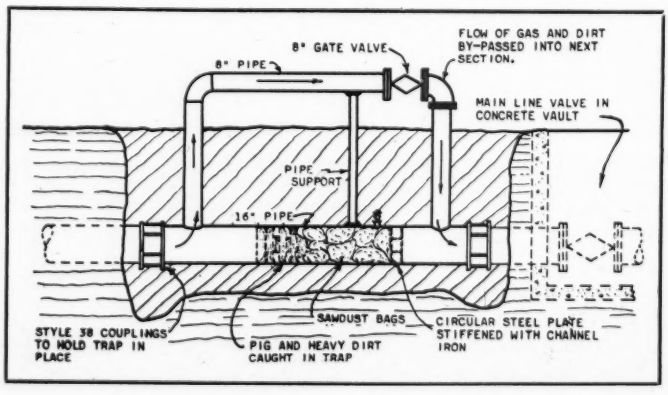

8" GATE VALVE
FLOW OF GAS AND DIRT BY-PASSED INTO NEXT SECTION.
8" PIPE
MAIN LINE VALVE IN CONCRETE VAULT
PIPE SUPPORT
16" PIPE
STYLE 38 COUPLINGS TO HOLD TRAP IN PLACE
SAWDUST BAGS
CIRCULAR STEEL PLATE STIFFENED WITH CHANNEL IRON
PIG AND HEAVY DIRT CAUGHT IN TRAP

Fig. 2 (above). Sketch of standard blow-off trap, showing how pig was caught. Fig. 3 (right). Sketch of by-pass trap, showing installation ahead of mainline valve, allowing stopping of pig and by-pass of gas.

Fig. 4 (left). Photo view of by-pass trap sketched in Fig. 3. Elbow at far end is turned up to vent gas to atmosphere, can be turned down to by-pass gas. Fig. 5 (above). Handler removes 500 m.g. of radium from cap in pig. Note spanner wrench.

there were also hot wrinkle bends, cold bends, and special long radius shop bends, with approximate 12-ft radius, no difficulty was anticipated from these types of bends.

Main line valves and creek crossings were important factors in the scheduling of operations, for they limited the length of line to be cleaned at one time to a comparatively short length. There are four creek crossings composed of 14-in. OD pipe. The seven main line valves are automatic piston-operated 16-in. plug valves spaced at intervals of 4 to 7 miles apart. Two of these valves are in manhole-type vaults which meant it was not feasible to remove them from the line in order to permit a through travel of the pig. The other valves are in open top vaults and could have been removed if it had been found essential.

Based on this information of line construction, with the principal limitations being 1½-radius ells, two 16-in., model WC-21 pipeline pigs *(Fig. 1)* were obtained from the Williamson Co.

The 14-in. OD pipe crossings mentioned above are short in length, i.e., ranging from 160 ft to 1700 ft, and hence it was felt they would not warrant the purchase of a special 14-in. pig. On the other hand, since the river crossings form low spots in the line where it was suspected that the most dirt might be trapped, they could not very well be omitted from the cleaning.

For these reasons, it was decided to have the 14-in. OD pipe sections cleaned by pulling through a rubber squeegee-type pig followed by a wire brush pig, both made by SoCounties. This method also permits a close inspection of the internal conditions of the pipe from the open ends of the crossings.

The Goleta No. 44 line was shut down as far as transmission service was concerned during the entire cleaning program, but gas was always available from either end of the line. Normally, the section between main line valves upstream of the section being cleaned was used as a reservoir filled with gas to 50 psi pressure. All runs except one were controlled from the 16-in. main line valves. Recording pressure gauges kept a record of pressures used during each run.

Actual cleaning did not follow progressively from one section to the next. Instead, work on various parts of the line was carried on simultaneously in order to expedite the completion of the job within the allotted time.

Extensive use was made of two-way radio cars throughout the entire cleaning program.

A standard blow-off trap with slots was fabricated to catch the pig at the end of a section in an area where no hazardous condition would be created by the blowing of gas and dirt into the atmosphere. Bars were placed in the end to stop the pig from being fired out because the pig would be severely damaged if it were allowed to fall free. Also, there was a possibility of personnel being injured. The blow of the pig striking this end stop was cushioned by about a dozen wet, sawdust-filled bags.

After being used once, this trap was altered by installation of an 8-in. gate valve on a short riser in place of the slots, as in *Fig. 2*. This was done because it was felt that a definite advantage would be gained by being able to seal off the end of the section. If the trap were installed on a high point in the line, air could be sucked in from any opening lower down. With welding operations going on at this lower point, an extremely dangerous situation could result if the proper mixture for an explosion were to accumulate. By filling the end of the trap with a canvas covered stopper bag in place of the steel bars and closing the gate valve, a suitable seal was obtained.

There were many areas in which such a trap as this blow-off fitting would not be practical because of the danger which escaping gas under pressure and dirt could cause. This was the case when the pig had to be removed from the line because of the location of main line valves or creek crossings in residential areas or next to heavily traveled highways.

For a trap in such areas as these, a fitting as shown in *Fig. 3* was fabricated. (This is also shown in *Fig. 4.)* This caught the pig and heavy dirt, but allowed the gas stream to flow over into

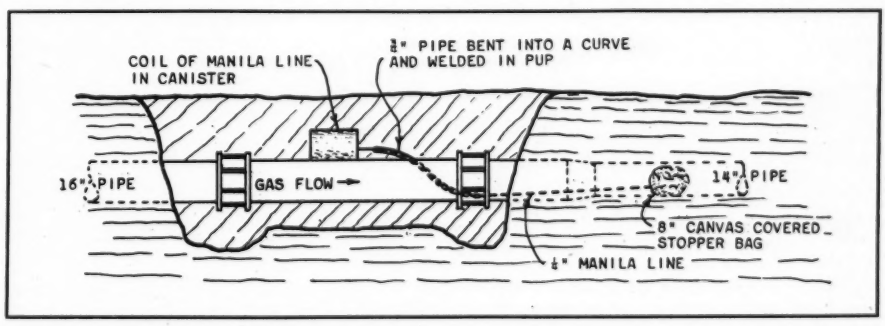

COIL OF MANILA LINE IN CANISTER
¾" PIPE BENT INTO A CURVE AND WELDED IN PUP
16" PIPE
GAS FLOW
14" PIPE
8" CANVAS COVERED STOPPER BAG
¼" MANILA LINE

Fig. 6. Sketch shows arrangement to blow 8-in. canvas gas bag through 1700-ft section of 14-in. creek-crossing pipe.

Fig. 7. This 15-in. wire-brush scraper was used to clean 14-in. creek-crossing line with winch trucks and steel cables.

the next uncleaned section of line. This type of fitting, called a by-pass trap, proved very satisfactory and no gas or dirt were blown into the atmosphere at its point of use.

Although the noise of the moving pig can generally be heard aboveground, there is always the chance that it might be missed because of the speed with which the pig moves or because of the depth of line. Also, once the pig stops there is no sure way of finding it, for no noise at all is audible from the gas by-passing open ports in the pig.

The possibility of losing the pig underground in the line during a run could not be overlooked. It was conceivable that the pig could become wedged in an angle or behind some obstruction of dirt so tightly that extreme pressure would be required to break it free. Since damage to the pipe might result from the pig suddenly breaking loose from a "hang-up" and hitting an angle a short distance down the line, it was decided to use some positive method of locating the pig if it were necessary.

The ability of a Geiger counter to detect radiations emitted from radium was put to use for this purpose. By attaching a 500 m.g. capsule of radioactive salt to the pig before insertion in the line, it was possible, with the Geiger counter above-ground, to detect the location of the pig *(Fig. 5)*. Although it was found that the counter could not pick up the radiations while the pig was moving, the location of the pig could be found by walking over the line with the counter when the pig had stopped.

In order to pull any sort of small pig through the 1700-ft section of 14-in. OD creek-crossing pipe, it was first necessary to feed a cable through. This was accomplished by removing a short section of line on each side and blowing through an 8-in. Goodman gas stopper bag attached to a ¼-in. manila line *(Fig. 6)*. Once the manila line was through, it was an easy matter to pull a 5/16-in. diameter steel cable through.

A rubber squeegee-type pig with an OD of 13 in. was attached to the steel cable and pulled back and forth several times by means of winch trucks. A small amount of liquid — mainly compressor oil and gasoline — was removed.

Next, a wire brush type pig *(Fig. 7)* was pulled through to scrape the inside wall clean. This brought out little dirt other than a slight mixture of oily, rusty grease which covered the pig.

The other three creek crossings were cleaned in a very similar manner. However, due to their shorter length, it was possible to push a string of ¾-in. pipe through in place of the cable. The pigs were attached to the ¾-in. pipe, as they had been to the cable before, and pulled through several times.

The section from which the most dirt was removed was a 6809-ft length of line. In this section, the WC-21 pig was pushed through a total of six times. Along with each of the first four runs, a large amount of dirty metal shot was removed.

An interesting event took place during the third run. As the pig was removed, a 6-ft steel crowbar was also pulled out. What made it of interest beyond the fact that the crowbar had been in the line since its construction was the fact that the pig had made two previous passes through the same section and had not brought it out. Also, it was fortunate that the bar had been lying with the pointed end upstream. If the bent end had been picked up first by the pig, it probably would not have wedged the way it had between the rubber cups and inside wall. It conceivably then could have been driven into an angle in such a manner as to hold the pig tightly — not to mention possible damage to the line itself.

A 10 psi, 1 rph chart, shown in *Fig. 8*, was made by a recording gage showing the pressure required to drive the pig during a run over a 25,000-ft section. It shows very clearly the pattern followed by the driving pressures and the pressure buildup initially needed to start the pig moving. Runs "A" and "B" indicate that once the pig is started it can be kept moving with a fairly constant speed, provided the average pressure is maintained high enough. In this run it was also found that no additional pressure was required when the pig had to go up a steep hill.

Run "C," however, was tried at a lower pressure than either "A" or "B." It was noticed that not only did it take considerably longer time, but that there were many rises and falls in pressure. This would tend to indicate that the pig

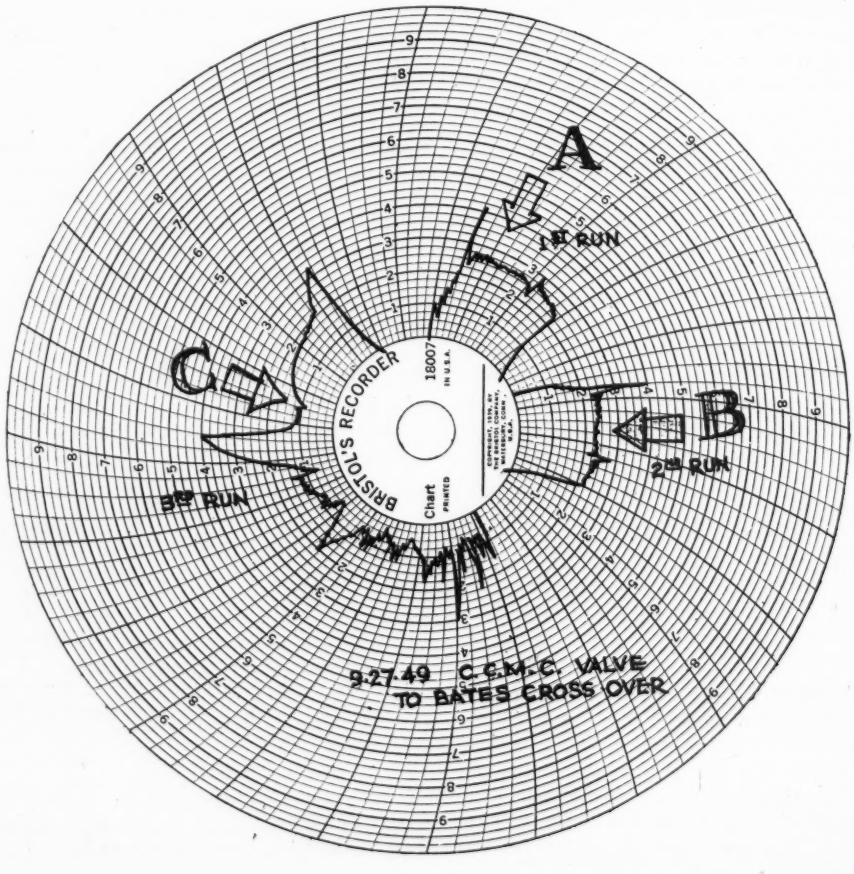
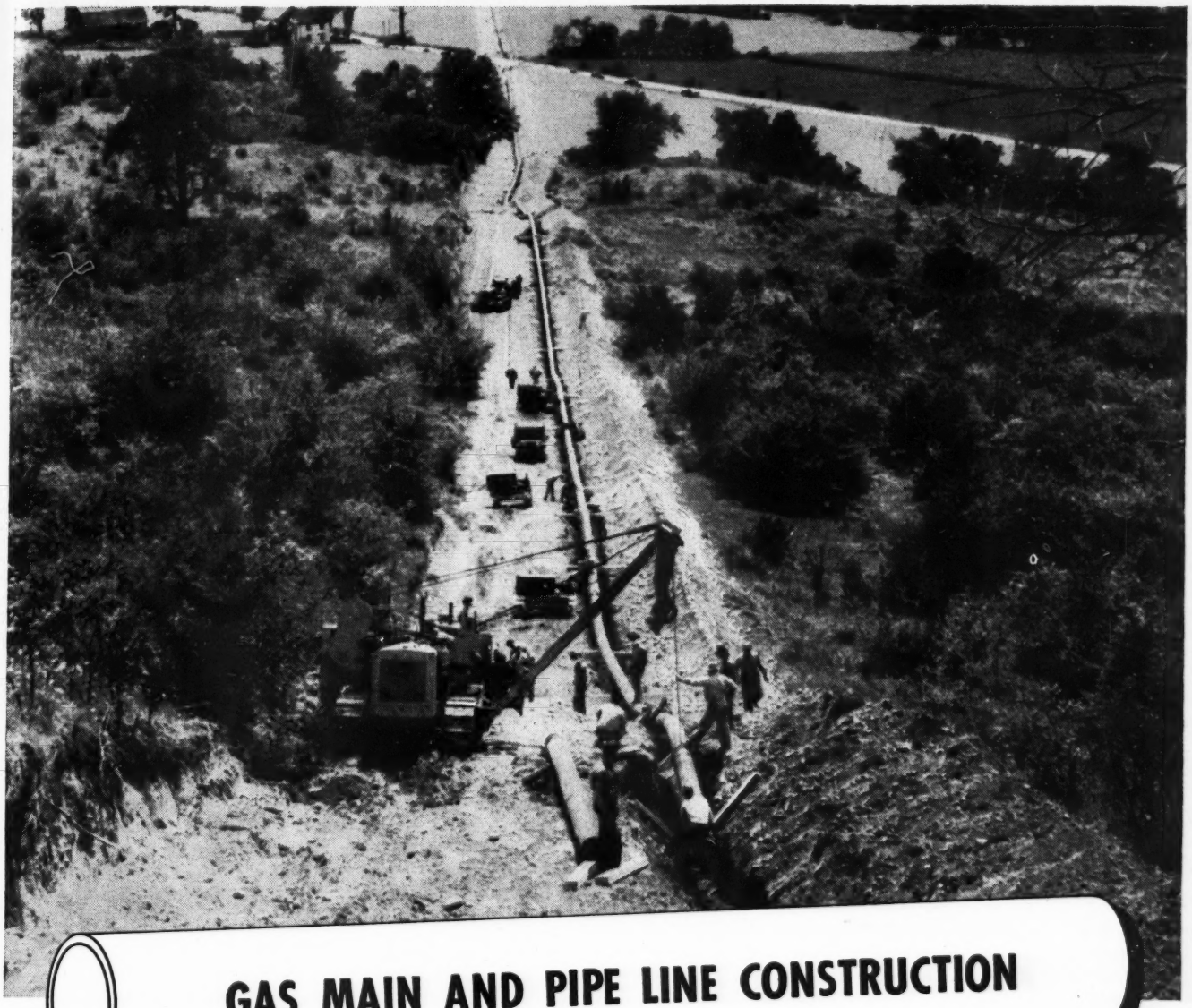


Fig. 8. A 10-psi chart made by a 1 rph recording gage during three separate runs of a WC-21 pig. Run was longer, pressure varied when driving pressure was kept at 1 psi on "C" run.



GAS MAIN AND PIPE LINE CONSTRUCTION

Photo Courtesy of
Niagara Mohawk Power Corporation

Early this year United Engineers re-entered gas main and pipe line construction. The current and completed work for utility companies consists of engineering and construction of distribution main extensions, river crossing designs, and construction management services for a lateral pipe line serving a gas plant from a main natural gas line distribution station. Field inspection and supervisory services are being furnished for several other cross country natural gas lateral pipe lines.

During the previous active period of this work, 159 installations of mains totaling over 1,000 miles in length were satisfactorily completed.

A working pipe line organization is again available to provide complete and flexible engineering, construction managing, and inspecting services for all phases of pipe line construction or any portion that may be required to augment the engineering and construction departments of utility companies.

UNITED ENGINEERS & CONSTRUCTORS INC

NEW YORK 17 PHILADELPHIA 5 CHICAGO 2

WITH A BACKGROUND OF OVER SIXTY YEARS' EXPERIENCE

Fig. 9. View of quantity of dirt removed from line by 16-in. RCN Williamson pig. Note good condition of brushes and cups.

moved along in a very halting motion, creating a condition where the pig might do damage to the line.

It should not be assumed from this chart that all driving pressures were similar to the three cases shown. This one chart is used solely to show runs "A" and "B," compared to run "C," as an example of the difference an increase of only 1 psi made in one section.

It was in a 12,250-ft section where 30° and 45° welding ells were first encountered that the WC-21 pigs suffered some damage. It is suspected that this damage resulted at one location where two such angles are separated by only a short distance. The pig was "hung up" at the first angle until the pressure was built up to a point which permitted the pig to clear the angle. Then the pig sped down the line 75 ft, where it encountered the second angle. Here the pig had no trouble in clearing the angle because of its momentum, but was damaged in passing the obstruction. A representative of the Williamson Co., who was present on the job at this time, stated that he had never experienced this difficulty before.

Realizing this was only the beginning of the area where there are many such angles, we obtained two 16-in. model RCN Williamson pigs that were designed to clear 1½-radius angles more easily because of their shorter length *(Fig. 9)*.

The reason this model had not been ordered originally was that there is no way in which wear of the brushes is compensated for. The two brushes are circular and are designed to fit tightly inside the pipe; the pig has two rubber driving cups similar to the WC-21.

While cleaning another section, the value of the radium and Geiger counter was proved. A main line valve was removed from its vault for this section and a 6-in. plug valve installed in its place to act as a control point. The pig was also inserted in the line at this point, which meant the control valve setup had to be lifted out each time the pig was used.

When movement of the pig during a run stops, it is quickly noticed, for not only does the pressure begin building up if the control valve is left open, but also the noise of the gas being pushed out ahead of the pig ceases. During this particular run it was definitely established that the pig had become stuck, even though a total of 14½ psi was applied. The operator of the Geiger counter then started walking over the line at a very slow pace. Practically an entire day was spent in covering the four miles of line in this section before the counter detected the radium.

The line was dug up and the pig located precisely where the operator had indicated. A 12° angle of weld ell and a piece of a trencher tooth were all that were found at this spot. Upon measuring the ell it was found to be roughly ½-in. out of round. The pig was in good condition for having passed through several 80° and 90° shop bends and two 70° and 80° sections of weld ells. This section was cleaned once again using the by-pass trap to catch the pig, but no dirt was brought out. This trap was also used at this location to control the gas when the pig was being pushed on to the next valve.

Considerable velocities were attained by the pigs during their runs. An overall average for runs of both the WC-21 and RCN pigs was in the range of 15 to 20 mph.

The total amount of measurable dirt removed from the line amounted to approximately 15 gals. of liquid, 30 lb or more of sludge and close to 500 lb of steel grit. There was very little dirt blown out of the trap fittings when they were vented to the atmosphere, and it is assumed that when the gas was bypassed there was practically no dirt carried over into the next section.

Internally, the line was not dry and dusty, nor rough from crustations or corrosion. Actually, it was wetted with light oil in sections. It was often found when the pig was removed from the line that, whereas the inside wall had been dry with a very thin scaly covering of light rust when first cut open, the walls after cleaning were covered with an extremely thin slick coating of oily tenacious sludge. No matter how tightly the brushes of the pig fitted inside the pipe, this type of thin sludge could never be entirely removed.

In a line that was entirely dry and contained a large quantity of loose dirt, a pig which had ports in it to allow for by-passing of a portion of the driving gas would be advantageous, as it would provide a means of carrying the light deposits ahead of the pig.

However, as it was found in cleaning the Goleta No. 44 line, no such conditions existed. Therefore, all ports were generally sealed. On one run, for example, when the ports were left open, a large quantity of loose steel grit was found behind the pig and not ahead of it as it was pulled from the trap.

As for the ports being used to aid in distributing wear of cups and brushes, there is also little value to be gained. The ports are set at an angle in a manner that by-passing gas would tend to rotate the pig as it moved along. The rotation, if any, is extremely slow because there is too much friction of the rubber cups and brushes against the pipe wall. In this cleaning job, more damage resulted to the pigs from bends and turns than there was from wear.

Tests showed the cleaning operations had resulted in an increase of line flow efficiency to 78%. This was an actual increase of 11%. In terms of parallel line that would have to be laid in order to give the same flow, this represents a total of 9½ miles.

Cleaning operations were completed in 21 days with the following average number of crews and equipment:

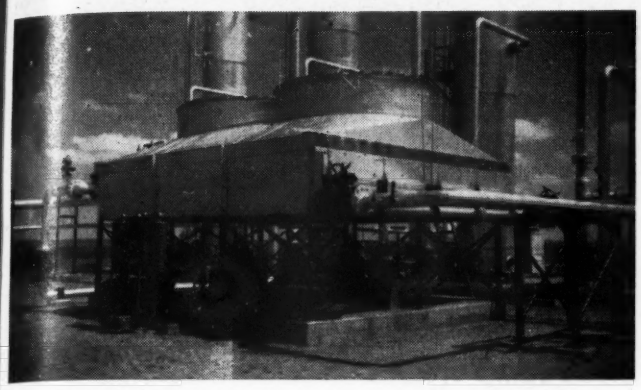
Contract crews and equipment

1—Excavating and backfill crew	3 men
2—Labor crews	6 men
3—Welders and helpers	6 men
1—Foreman	1 man
2—Flat bed trucks with boom crane	
3—Welding generators (truck mounted)	
2—Pick-up trucks	
Geiger counter operator	1 man

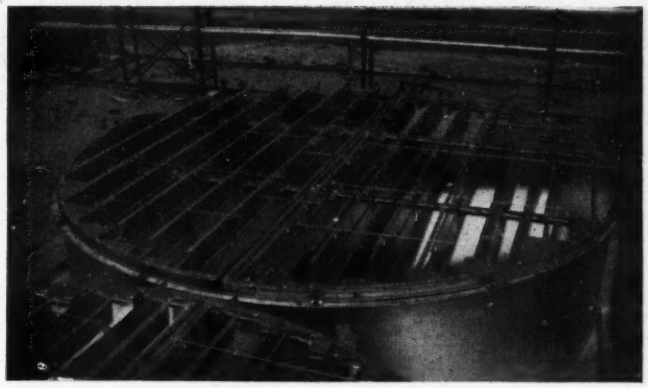
Company crews and equipment

1—Welder and helper	2 men
1—Labor crew	4 men
4—Radio operators	4 men
1—Welding inspector	1 man
1—Welding generator (truck mounted)	
4—Radio equipped cars	
2—Pick-up trucks	

Costs of cleaning amounted to approximately $830 per mile of line cleaned, or an expenditure of $1250 per MMcf/D of increase in capacity. It is easily seen that this is a considerably less expensive method of recovering a line's throughput than the laying of a parallel line which would cost in the neighborhood of $23,000 per MMcf/D. With this experience, it is anticipated that any future cleaning could be carried on with even less cost.



Coolers take hot gas from dehydrating towers (at rear).



Discharge end of coolers showing damper blades.

Variable Control for Gas Coolers

Specially-designed dampers regulate air circulation, prevent freezing of tubes

By E. B. SHEKER

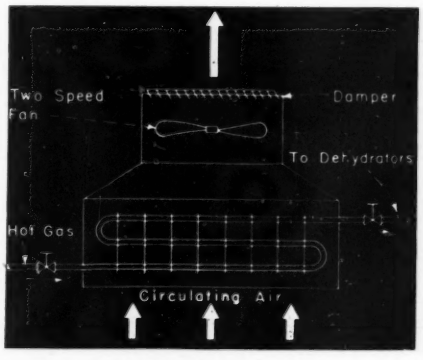
ONE of the most recent improvements in the art of natural gas dehydration has been achieved by the Cities Service Gas Co. in the operation of its gas coolers. At its Hickok, Kan. plant, a venturi type gas cooler is used to cool hot reactivation gas. Due to seasonal fluctuations in air temperature, variable control of the circulating air flow through the cooler is required. For effective control of circulating air flow to enable efficient cooler operation, special Honeywell dampers were recently installed on the exhaust end of the coolers.

Gas is heated to 450°F for reactivation of the dehydrating towers. This hot, moisture-laden gas is removed from the tower and cooled in venturi type coolers. After condensate is removed, the gas is returned to the main gas stream to be dehydrated, so that no gas is consumed or vented during the reactivation operation.

For the cooler to function effectively, sufficient control of circulating air must be provided to allow for changing external temperatures. A two-speed fan draws air past finned type tubes through which hot gas flows. As outside air temperature decreases, fan speed is reduced until, during coldest weather, the fan is stopped completely. Even though the fan is stopped, however, there is enough circulation of cold air, caused by hot gas passing through the tubes, to lower the temperature sufficiently in the bottom rows of tubes to form gas hydrates that freeze at 60°F.

To prevent cooler tubes from freezing, it was at once apparent that additional control of circulating air was required. A solution that was not only obvious, but also ideal for the situation, was to install dampers on the discharge end. With dampers completely closed, natural circulation of freezing air is stopped, thus maintaining gas temperatures within safe limits.

The addition of dampers makes possible better over-all operation of the cooler by enabling closer control of output gas temperature. By various combinations of fan speeds and damper openings, any desired rate of circulating air flow is obtained. Consequently, gas is delivered to the dehydrating towers at the most desirable temperature.



VENTURI TYPE fin-blade gas cooler operation.

Dampers used on the venturi coolers are of special Honeywell design, each measuring 11 ft 2 in. in diameter or a total of 99 sq ft in area. Each damper is made of four sections, which are bolted together on a circular frame that mounts directly on the cooler. In this particular application, the dampers are manually controlled by means of a single crank at one end.

Venturi type coolers with dampers are used to advantage wherever gas cooling within approximate limits is required. Since effective control of the moisture content of gas depends upon gas temperature, venturi type coolers may be used to cool the gas to approximately the proper temperature prior to dehydration or any other form of moisture separation.

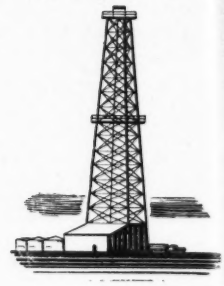
In addition to gas cooler applications, dampers are in general use to control circulating air in temperature and pressure control systems. Usually the dampers are automatically controlled by means of either a pneumatic or electric motor with a temperature or pressure controller as the prime mover.

Honeywell dampers are built to specifications, in various standard types and sizes, and in both round and rectangular shapes for numerous industrial applications.

Mr. Sheker is an application engineer with Brown Instruments division, Minneapolis-Honeywell Regulator Co., Philadelphia. Reprinted from "Instrumentation," publication of Minneapolis-Honeywell Regulator Co.

IS THIS "COMMODITY VALUE"?

Sweeping Price Increases Foreseen if High Court Upholds Wellhead Price Fix



By SAMUEL H. CROSBY

OKLAHOMA, now followed by Kansas, is making legal history. The Oklahoma Corporation Commission adopted this order, which became effective on Jan. 1, 1947.

Exclusive

> That no natural gas shall be taken out of the producing structure or formations in the Guymon - Hugoton field in Texas county, Okla. at a price, at the wellhead, of less than 7 cents per thousand cubic feet of natural gas measured at a pressure of 14.65 psia.

The Kansas order fixed a wellhead price of eight cents per thousand for all gas taken from the Hugoton field and became effective March 1, 1949. Litigation immediately followed and the supreme courts of both states have upheld their respective commissions. The Supreme Court of Kansas did not announce its decision until Oct. 9 and on that same day the U. S. Supreme Court announced that it would review the order of the Oklahoma commission in Cities Service Gas Co. vs. Peerless Oil & Gas Co. In an earlier order the court had agreed to consider the appeal of Phillips Petroleum Co., also a plaintiff in error before the Oklahoma Supreme Court in the same proceeding.

Parallel Cases

Arguments were heard and the case submitted the first week of November. It is not the purpose of this article to comment upon the proceedings before the U. S. Supreme Court which were lengthy, involving weighty constitutional questions. From the nature of the case it seems likely there will be a considerable delay before the court's decision is announced. Although the Kansas case differs in important respects from the Oklahoma case the controlling legal principles laid down in the case before the U. S. Supreme Court may be expected to settle the basic issues which were before the Kansas Supreme Court.

The state commissions base their actions upon state laws requiring them to enforce conservation and prevent waste of natural gas. The ultimate finding of the Oklahoma commission goes to the heart of the problem:

> For the purpose of preventing waste, economic and physical, of natural gas, for the purpose of protecting correlative rights, and to insure the greatest ultimate recovery of natural gas from the common reservoir involved, this commission should not permit natural gas to be taken out of the producing formations in the Guymon-Hugoton field at a price of less than 7 cents per thousand cubic feet . . .

What Commission Found

The commission after an extended public hearing had found that:

> The persons and corporations operating pipelines and transporting natural gas out of the Guymon-Hugoton Oklahoma gas field own or control a greater portion of the oil and gas leases in said field and control the outlets for natural gas produced in said field, and have therefore been able to dictate and have dictated the price, measurement and terms of the taking of natural gas taken in the Guymon-Hugoton Oklahoma gas field. Producers without a connection have been required to accept the price, measurement and terms offered by operators of pipelines in said field or shut down their wells.
>
> There is no competitive market of natural gas in the Guymon-Hugoton Oklahoma oil field, but said market has been stifled by reason of the control of acreage and markets by the pipeline operators in said field, and as a result natural gas is being taken out of the Guymon-Hugoton Oklahoma gas field at a price far less than its actual, or fair market value, and at a price which is far less than the value of natural gas for heating and other purposes as compared to the value of other fuels.

The commission also found that:

> The taking of natural gas from the Guymon-Hugoton Oklahoma field at prices and under terms and measurement now prevalent in said field results in and causes:
>
> (a) Economic waste of a great natural resource, to-wit: natural gas;
>
> (b) Actual physical waste of natural gas;
>
> (c) Loss to the royalty owners in said field;
>
> (d) Loss to the state of Oklahoma in revenues in the form of gross production taxes. (The State School Land Commission owns about 50,000 acres in proven territory);
>
> (e) Inequitable taking of natural gas from the common source of supply involved;
>
> (f) Discrimination against various producers in the field.

That, then, is the case for the state of Oklahoma. The commission's unprecedented action was not taken hastily. A full year elapsed after the hearing before the order was issued.

Whereas the Guymon-Hugoton area had only 300 gas wells when the commission had its hearing there were about 1000 in the Hugoton (Kansas) field at the time of the Kansas hearing. The pool crosses Texas county, Oklahoma, a distance of about 30 miles, into the Texas Panhandle. The current bulletin of the Interstate Oil Compact commission reports that now there are 2008 producing wells in Hugoton (Kansas) connected to pipelines. The proven acreage in Kansas is around 2,250,000 which will permit 4000 wells drilled one-to-the-section, the approved spacing. The ultimate stake of Kansas is therefore many times greater than that of Oklahoma if the Supreme Court upholds state regulation of wellhead prices of gas.

Price Fix Constitutional

If we try to speculate upon the outcome of the Oklahoma case in the court of last resort, we will immediately recall Nebbia vs. New York (291 U.S. 502) upon which the Oklahoma court leans, and the principle there sustained:

> Price control, like any other form of regulation is unconstitutional only if arbitrary, discriminatory, or demonstrably irrelevant to the policy the legislature is free to adopt, and hence an unnecessary and unwarranted interference with individual liberty.

Mr. Crosby was formerly counsel for E. Holley Poe & Associates.

In the recent case of Federal Power Commission vs. Panhandle Eastern Pipe Line Co. (337 U.S. 498) the court upheld Panhandle's right to sell leases on 97,000 acres of proven gas lands to a wholly owned subsidiary without let or hindrance of the Federal Power Commission, because Section 1(b) of the Natural Gas Act excludes jurisdiction over production and gathering. The court says in its opinion:

> The legislative history of this act is replete with evidence of the care taken by Congress to keep the power over the production and gathering of gas within the states. This probably occurred because the state legislatures, in the interests of conservation, had delegated broad and elaborate power to their regulatory bodies over all aspects of producing gas. . . The Natural Gas Act was designed to supplement state power and to produce a harmonious and comprehensive regulation of the industry. Neither state nor federal regulatory body was to encroach upon the jurisdiction of the other. Congress enacted this act after full consideration of the problems of production and distribution. It considered the state interests as well as the national interest. It had both producers and consumers in mind. Legislative adjustments were made to reconcile the conflicting views.

In the early thirties, flush production and waste of petroleum in east Texas persuaded some important men of the industry that federal control of production might be desirable. High officials of several producing states, particularly Oklahoma, Kansas, and Texas, proposed an interstate compact which is permitted by the federal constitution, to undertake a systematic solution of production problems through state commissions, working essentially in concert. Under the determined leadership of Governors Allred of Texas, Marland of Oklahoma and Landon of Kansas, the Interstate Oil Compact Commission to conserve oil and gas finally came into being and Congressional approval became effective in August, 1935. The paragraph from the opinion of the Supreme Court in the Panhandle case, just quoted, is tacit recognition of the tremendous contributions to the cause of conservation which have resulted from the joint efforts of the states, united and coordinated under the compact.

Confiscation Possible

Should the court now conclude that price fixing is an appropriate and constitutional power of the states, when invoked as a means of enforcing conservation, approximate uniformity of price throughout the Hugoton field may be expected almost immediately. However, such a decision will also deprive many citizens of the right and privilege they have heretofore freely exercised—the right to sell their gas at whatever price is acceptable to the owner of the land! Such a decision, without many qualifications, would probably be called confiscation and deprivation of property without due process. But it well may become and remain the "law of the land."

In the Interstate (Louisiana) case the Supreme Court held in effect that it is the duty of the Federal Power Commission to investigate and control prices paid to all producers of natural gas entering interstate pipelines. In the words of the court's unanimous opinion by Chief Justice Vinson—

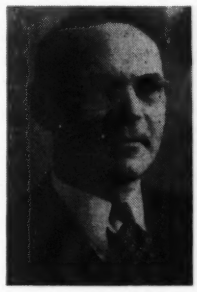
> We have held that these sales are in interstate commerce. It cannot be doubted that their regulation is predominantly a matter of national, as contrasted to local, concern. All the gas sold in these transactions is destined for consumption in states other than Louisiana. Unreasonable charges exacted at this stage of the interstate movement become perpetuated in large part in fixed items of costs which must be covered by rates charged subsequent purchasers of the gas including the ultimate consumer. It was to avoid such situations that the Natural Gas Act was passed.

Companies May Benefit

If now the court upholds the power of the states to fix well prices of natural gas of course it will be assumed that unless or until the Natural Gas Act is amended the Federal Power Commission will allow as the cost of gas the minimum wellhead price so fixed. Some of the pipeline companies which seem to strongly oppose the new regulation do now produce a large part of their gas and the Federal Power Commission now allows them to charge only their costs of production at the intake, with interest on their actual land or lease investment. What those companies now oppose may conceivably enrich them. Escape from FPC's well established regulation of production as a *utility function* would make certain companies millions of dollars, and maybe serve the companies even better than the legislation they have unsuccessfully sought from Congress.

From the standpoint of conservation and the long range interest of domestic consumers it would probably be fortunate if field prices of gas might advance to a point where in the principal markets delivered prices would at least equal the prices of oil and coal on a thermal basis. In too many areas gas is not only the best fuel but the cheapest. Except for profit on unregulated direct sales to industry, a higher price paid to the producer would not affect pipeline earnings. Whether by voluntary policies or state regulation of field prices something like the commodity value of the gas at the well should rightly be paid and the present trend in industry practices, plus the substantial interests of the states, encourage confidence that this goal will be achieved.

Pipeline People



A. C. Ross **H. K. Beck**
. . . Worthington Pump

Two long-time employees of Worthington Pump & Machinery Corp., Harrison, N. J., have taken on additional duties. HAROLD K. BECK has been appointed commercial vice president, but he will remain at his post as manager of the Washington, D.C., office. The company's Buffalo works manager, AUSTIN C. ROSS, has been elected a vice president. Worthington has also announced the appointment of LOUIS G. HILKEMEIER as chief engineer of the construction equipment division at Dunellen, N. J.

Two executives of Tennessee Gas Transmission Co., Houston, have been elected officers of the Sterling Oil & Gas Co. R. G. RICE, TGT vice president, was elected president of Sterling, and W. D. WALSER, secretary of Tennessee Gas, was elected secretary. Both will also continue in their positions with TGT. WALTER G. STERLING, president of Sterling Oil & Gas, was named chairman of the board.

RALPH C. GRAHAM, who is vice president of Sterling, was recently elected vice president of Tennessee Gas. He has been with TGT since 1945.

On Oct. 1, W. L. SHELGREN, district manager for Dresser Manufacturing Division, Bradford, Pa., celebrated his 25th anniversary with the company. He joined the sales force in 1936.

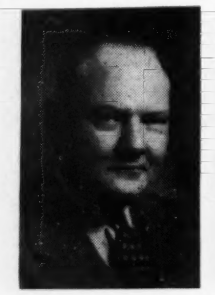
Customers of Dresser Manufacturing Division, Bradford, Pa., in 10 states will be working with HENRY F. PEEBLES, recently appointed Southeastern representative. Mr. Peebles joined the company two years ago.

J. B. Harshman

New vice president in charge of H. C. Price Co.'s (Bartlesville, Okla.) pipeline division is J. B. HARSHMAN, who for the past year and a half has been supervising construction operations on the northern end of the Transcontinental line for Fish Constructors Inc., Houston. Mr. Harshman succeeds J. P. NEILL, who is leaving the Price organization Jan. 1 to engage in independent operations.

Creation of two positions and promotion of four executives have been announced by Caterpillar Tractor Co., San Leandro, Calif. HARMON S. EBERHARD has been named an executive vice president and R. G. OVERPACK has been appointed assistant service manager of the western division. Promotions include WILLIAM BLACKIE, vice president, who will also coordinate activities of the company's various plants; E. W. JACKSON, director of parts and service, and RALPH M. MONK, director of industrial relations, who were named vice presidents; and W. H. FRANKLIN, controller, who has taken over additional administrative duties. A. N. WHITLOCK, assistant controller, assumes direct supervision of accounting.

Cooper - Bessemer Corp., Mount Vernon, Ohio, is under way on a new engine development at its headquarters plant and for several months JOHN FULLEMAN, Swiss-born authority on engine supercharging and centrifugal compressor design, has been working with the company's engineering staff on the project.



R. S. Bruns, Jr.
... Transcontinental

J. Fulleman
... Cooper-Bessemer

Election of ROBERT S. BRUNS JR. as a vice president of Transcontinental Gas Pipe Line Corp., Houston, was announced recently. He will be in charge of the corporation's eastern operations.

Transfer of E. W. LAWLOR, sales-service representative of Pittsburgh Coke & Chemical Co., from Pittsburgh to the Tulsa office of the firm's Protective Coatings division has been announced. Mr. Lawlor will assist Frank McNulty, Tulsa manager.

Byron Jackson Co., Los Angeles, has announced the appointment of C. O. RELEPHORD as branch manager for its pump division. The Los Angeles territory will include several western states, Mexico, and the Far East. Mr. Relephord has been associated with the company's Houston office.

Key positions in Northern Natural Gas Co.'s (Omaha) compressor department have been filled by J. W. ALIX, promoted to superintendent of the new compressor station at Holcomb, Kan., and MERLIN J. ESSLINGER, moved up to assistant superintendent at Sublette, Kan.

Hinderliter Tool Co., division of H. K. Porter Co. Inc., Tulsa, has appointed P. J. GALLAGHER as general sales manager. Mr. Gallagher was formerly district sales manager for Porter in Detroit, and more recently, he was sales manager for valves in Tulsa.

PIPELINE NEWS

FPC SPLITS NEW ENGLAND NATURAL GAS MARKET

Northeastern gets north, west sectors; Algonquin still must prove supplies

Part of New England is going to be served with natural gas, the FPC decided last month. Most of the rest of the area, excluding Maine and Vermont, will probably also be served, as the way has been left open under terms of the commission's decision.

The nod went to Northeastern Gas Transmission Co., Tennessee Gas Transmission Co.'s affiliate. A service area was also dedicated to Algonquin Gas Transmission Co., Northeastern's former competitor, if it can show itself ready and able.

The decision failed to resolve the problem of integration of the system, although this may yet be achieved if the commission has its way, but it did split up the territory into what FPC considers a more equitable and feasible arrangement for providing gas to New England. Duplication of facilities has now been eliminated.

Northeastern's Slice

Roughly, Northeastern's area will include the northern and western portions of the total area, in a slice of land beginning at the southwestern tip of Connecticut, and lying to the northwest of an imaginary line bisecting Connecticut diagonally and cutting across Massachusetts from the south central portion (still diagonally) to the northeast tip of the state. Included in this slice are cities in New Hampshire. Thus it loses some of the cities it originally intended to serve, but adds others that were to have been customers of Algonquin.

Northeastern will get its gas, as planned, from Tennessee and Transcontinental Gas Pipe Line Corp.

Included in the Northeastern project are 400 miles of line and appurtenant facilities. Northeastern's system will take gas from Tennessee Gas at Pittsfield, Mass., from Transconutinental at Greenwich, Conn.

Total estimated peak-day requirements in the fifth year (1956) are 207 MMcf, with annual requirements reaching 47 billion at that time. TGT will supply 156 MMcf, Transcontinental 64.

Northeastern's Customers

The following companies will be served:

Connecticut: Connecticut Light & Power, Winsted and Norwalk; Connecticut Power, Torrington and Stamford; Greenwich Gas Co., Bridgeport Gas Light, Derby Gas & Electric, Danbury & Bethel Gas & Electric Light, Wallingford Gas, New Britain Gas Light.

Massachusetts: Pittsfield Coal Gas, Springfield Gas Light, Holyoke Gas & Electric Dept., Fitchburg Gas & Electric, Lynn Gas & Electric, Lowell Gas, Haverhill Gas Light, Westfield Gas & Electric, Northern Berkshire Gas, Northampton Gas Light, Worcester County Electric, Spencer Gas, Wachusett Electric, Leominster Gas Light, Athol Gas & Electric, Arlington Gas Light, Malden & Melrose Gas Light, Suburban Gas & Electric, Salem Gas Light, Beverly Gas & Electric, Gloucester Gas Light, Lawrence Gas & Electric, Worcester Gas Light, and Haverhill Electric.

New Hampshire: Gas Service Inc., Nashua; Manchester Gas Co., Concord Gas Co.

The remaining markets will provide a suitable system for Algonquin when it proves it has the available gas supply, said FPC. Fifth-year peak day needs will be 184 MMcf, with annual requirements at that time of 40 billion.

Included are:

Massachusetts: Brockton Gas Light, Taunton Gas Light, Fall River Gas Works, Cambridge Gas Light, Dedham & Hyde Park Gas, New Bedford Gas & Edison Light, Plymouth Gas Light, Milford Gas Light, Boston Consolidated Gas, Old Colony Gas, Buzzards Bay Gas, and Norwood Gas.

Rhode Island: Blackstone Valley Gas & Electric, Providence Gas, Newport Gas Light, Narragansett Electric Co. (Westerly and Bristol Warren).

Connecticut: Connecticut Power, New London; Connecticut Light & Power, Waterbury, New Haven, Putnam, and Williamantic; New Haven Gas Light; Mystic Power, Hartford Gas, Norwich Gas & Electric.

New Jersey: Jersey Central Power & Light.

FPC told Northeastern it will have to stand ready to establish interconnections with any other suppliers for emergency interchange of gas.

TGT Gets Go-Ahead

The decision gives the green light to Tennessee Gas Transmission on its $118 million expansion program. TGT, which has already spent $100 million this year and on Nov. 1 passed the 1-billion-a-day mark in gas volume deliveries, will now add 250 MMcf a day to its capacity. This, plus other anticipated increases already authorized but not effected, will round out TGT capacity to 1310 MMcf. In connection with Northeastern's case, TGT was authorized to build 303 miles from the present terminus, Buffalo, to the New York-Massachusetts line, as well as 786.6 miles of loop along its existing line, 69,600 hp in existing compressor stations and 42,080 in seven new ones; and 75 miles of laterals.

Other companies that will benefit thereby are United Fuel Gas Co., Charleston, W. Va., 25 MMcf; Inland Gas Corp., Ashland, Ky., 20 MMcf; Godfrey L. Cabot Inc., 5 MMcf; New York State Natural Gas Corp., 15 MMcf; and one of three companies in northeastern Ohio—Erie Gas Service Corp., Lake Shore Pipe Line Co., and Grand River Gas Transmission Co., whichever is certificated to serve its proposed area—17 MMcf. Cumberland Gas Corp. will get another million, and other towns along the system will receive the remainder.

Transcon, under terms of the Northeastern

plan, will build 35.5 miles of 24-in. from Berger county, N. J., to Greenwich, Conn., plus a 6000-hp station in Westchester county, New York, and an 8-in. lateral to serve Paterson, N. J. Total cost is $6.5 million.

However, since Transcon's program is tied into another docket, final okay will await disposition in that case. Transcon was ordered to supply 15 MMcf per day to Philadelphia Gas Works Co.; but Rockland (N.Y.) Light & Power's request for a service connection was denied.

New York State Natural will pass along Tennessee Gas deliveries to Niagara Mohawk Power Corp., Syracuse. Up to 15 billion a year will be carried through 10.4 miles of line from two connections with New York's authorized Albany line. The two lines will connect with Niagara Mohawk's Utica system. Niagara will spend $1.3 million for 15.3 miles of line and connecting facilities.

Commissioner Thomas C. Buchanan, who previously dissented when the FPC told both Northeastern and Algonquin to remake their original applications, again demurred.

Buchanan Objections

Pointing to the majority opinion that the balance of the markets in New England should be served by Algonquin upon a showing by that company that it has an adequate supply of natural gas to serve such markets, Commissioner Buchanan stated: "Coupled with the denial of that portion of the application of Northeastern not authorized by the majority it apparently reads out Northeastern and any other potential applicant. Does it, in effect, make an exclusive determination upon the application of Algonquin Gas Transmission Co. . . . before the record of that proceeding is completed? What is the propriety of such conclusions at this time even though conditioned upon a future showing of an adequate gas supply? Suppose Algonquin fails to make such a showing—what then? Will it mean a longer delay while Algonquin is attempting to improve its gas supply or does it mean that Northeastern will be given the opportunity to serve its customers that were proscribed by the majority decision? What of the interest of the consumer if it is denied the service from any other applicant which might present a more favorable service than that presently offered by Algonquin?

"The decision of the majority, in my opinion, deprives the balance of the New England area of the instrumentality through which that area would receive natural gas service eventually by the quickest and most available means."

(For further information see *GAS*, Oct. p. 128 and Nov. p. 87.)

United Fuel Plan Okayed

The Federal Power Commission has authorized United Fuel Gas Co., Charleston, W. Va., to build about five miles of pipeline and three compressor stations in West Virginia in connection with expansion of underground storage facilities.

The new facilities will allow United Fuel to add about 17 billion cu ft to the total in its five storage fields this year. Peak day deliverability of the five fields will be raised from about 189 MMcf to 272 MMcf, United Fuel officials said.

VIRGIN STORAGE FIELD

Texas-Illinois tests Kankakee reservoir

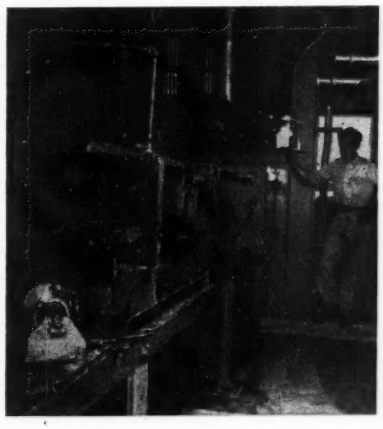
A vital new addition to the industry's fund of gas technological knowledge, as well as an important potential solution to the winter peak problem, may result from an investigation now under way by Texas - Illinois Natural Gas Pipeline Co. to develop a virgin underground gas storage area in Kankakee county, 65 miles west of Chicago.

The possibilities of utilizing natural underground reservoirs which have never produced any petroleum products has intrigued the winter peak - plagued gas industry for some time. The current tests may uncover the answer to the pressing need for heavy cold-weather deliveries which has kept engineers of Peoples Gas Light & Coke Co., Texas-Illinois' principal owner, in constant search of an answer. Already served by Texas gas through Natural Gas Pipeline Co. of America and scheduled to receive additional large volumes when the Texas-Illinois line is placed in service, Peoples is still hard-put to keep pace with burgeoning demand.

In the test, geologists will drill as many as 50 shallow holes along highway rights-of-way to determine the structure of the Kankakee area. Strata there have been folded in a dome-like formation which indicates the presence of a deeper sandstone layer which might prove practicable for storage use. Two deeper holes will be drilled to the sandstone level, 1600 ft.

If these tests prove successful, other investigations will be made in the Gibson City area.

The hunt for peak-shaving methods by Peoples extended a year ago to the investigation of natural gas liquefaction, and the company went as far as making formal application to the Federal Power Commission for permission to construct such installations before the idea was dropped. (See *GAS*, October 1949, p. 92 et seq.)



Tulsa Pipe Coating Co. recently held an open house at its plant in Tulsa to demonstrate the operation of the Wheelabrator, pipe cleaning equipment which works on a blast principle. Pipeline contractors, engineers, and operators attended the demonstration presided over by Gaines Laster, I. L. Brunkow, and L. S. Rogers who own and operate the company.

The demonstration (see photo) showed how fine metal shot is driven under high pressure by motor - driven fans into the large metal container against the outer surface of the pipe as it goes through on pipe dollies. The shot penetrates deep pits and depressions in the pipe. Rust and dirt removed from the pipe settle to the bottom of the container and are forced into a dust bin by another fan.

New York State, Texas Eastern Get Okay on Storage Plan

Authorization to acquire, develop, and operate a multimillion dollar underground storage project in Westmoreland county, Pennsylvania, has been given by FPC to New York State Natural Gas Corp. and Texas Eastern Transmission Corp.

The companies will acquire the Oakford storage field from Peoples Natural Gas Co. (which is, like New York State Natural, an affiliate of Consolidated Natural Gas Co.) at a cost of more than $20 million to each company.

The companies will inject 105 billion cu ft of natural gas into the storage area, 60 billion of which would be for withdrawal, the remaining 45 billion being held as base or "cushion" gas. New York State Natural will build a 70-mile, 20-in. pipeline from the area to a connection with facilities of East Ohio Gas Co., another affiliate. It would sell gas from the storage area to East Ohio and to Peoples Natural.

Texas Eastern would use the storage gas to sell to its customers in the New York-New Jersey-Philadelphia area who do not have storage facilities of their own. This will allow Texas Eastern to deliver gas to them to meet peak requirements at a much lower cost than would be possible with peak-shaving.

Already partly equipped with field lines, measuring and regulating equipment, and well facilities, the Oakford field consists of approximately 21,500 acres, 19,000 of which are the producing portion. Gathering and well lines, metering stations, a 30,000-hp compressor station, and considerable appurtenant facilities must be added, however.

It is expected that New York State's deliveries to East Ohio and Peoples will satisfy the increasing peak period needs of Pittsburgh and Cleveland.

Texas Eastern, which will build 35 miles of 30-in. line from storage to its own line in Pennsylvania, will provide all base gas, the 45 billion figure to be reached in 1955. Each company will provide its own "top storage" gas.

Handling of Lynchburg and Other Cases Keeps FPC Busy

A busy FPC staff, its dockets bulging with a volume of applications which failed to reflect any war scares or shortage fears, last month was scheduling and rescheduling cases for timely disposition.

Continuance from Nov. 9 to Dec. 8 was ordered in the case of Virginia Gas Transmission Corp., seeking approval of the

sale of a 30-mile lateral to Lynchburg (Va.) Pipe Line Co. The line connects Virginia's main line near Lexington with the Lynchburg Gas Co. system, which has been buying direct. Lynchburg Pipe Line, which wants to step in as middleman, asked the continuance.

Hearings on two applications of Southern Natural Gas Co., Birmingham, Ala., to build facilities to up deliveries to Atlanta, Ga. and to sell gas to Alabama and Mississippi communities, began Nov. 8.

Hearings started Nov. 20 on the request of the city of Trinidad, Colo., for an order directing Colorado Interstate Gas Co., Colorado Springs, to connect its facilities with those the city proposes to construct. Having abandoned a gas manufacturing plant last January, Trinidad wants to spend $1.1 million for a 35-mile line and other equipment to receive Interstate gas. Interstate is fighting the plea on the grounds that on peak days present customers need all the gas it can deliver.

On Nov. 6, Washington hearings got under way on the Tennessee Gas Transmission Co. (Houston) application to build a sales meter on its mainline in Chatauqua county, New York, to sell 600 Mcf per day to Republic Light, Heat & Power Co., Buffalo, for resale to Mayville, Westfield and Chatauqua.

At the request of Northern Natural Gas Co., Omaha, the commission set forward until Jan. 26 the hearing on a joint application by Northern and Independent Natural Gas Co., Pampa, Texas, covering the sale of 21 miles of line and a compressor station in Texas.

GAS FROM CANADA

Westcoast Transmission asks FPC for line to U. S.

New life was breathed into hopes of the Northwest for natural gas last month when, on the heels of an encouraging report of reserves in Alberta, Westcoast Transmission Co. Inc., placed before FPC its formal application to build a 615-mile carrier from the Canadian border to serve Oregon and Washington markets.

The construction, costing $25.7 million, would link with a system which Westcoast's Canadian affiliate, Westcoast Transmission Co. Ltd., would build north of the border.

The American company is a newly formed Wilmington, Del. corporation.

The fact that Westcoast's application followed closely the publishing of a new estimate of reserves by Dr. G. S. Hume, director of the dominion's department of mines and technical surveys, was considered significant. Dr. Hume's report placed proved-and-probable reserves at between 6 and 7 trillion cu ft, more than ample for the needs of the province.

Whether Alberta was going to permit export out of the dominion, however, in view of other recent plans for lines to take the gas to eastern provinces, was still moot, according to late reports.

Westcoast's plan envisions the receipt of an initial 104 MMcf — to increase to 216 during the fifth year — at the border near Sumas, Wash. Two mainlines would serve U.S. markets. One would run south to Portland, Ore., with short branches to Bellingham, Everett, Mt. Vernon, Bellevue, Seattle, Tacoma, Olympia, Chehalis, Centralia Kelso, Longview, all in Washington, and St. Helens, Ore. The second line would take off from the vicinity of Osoyoos, B.C., extending to Spokane and the atomic energy plant at Hanford — both in eastern Washington.

The two lines would be respectively 277 and 266 miles in length. Seventy-two miles of laterals and 13 measuring and regulating stations would also be built. Later addition of 4000 hp in compressor facilities would boost the total load to 221.

Westcoast Ltd. would build a system extending from Alberta through British Columbia to Sumas and a spur from a point near Princeton, B.C. to another point of connection with the U. S. affiliate at Osoyoos. The Canadian company would also build lines to serve Vancouver.

The proposed line to Montreal and other eastern points has had northeasterners worried, as they fear there would not be enough gas for their needs should such a project materialize. However, Ray C. Fish, head of Pacific Northwest Pipeline Corp., which has its oar in for a line from Texas to Seattle, with a feeder line to bring extra volumes from Alberta through the U.S. and on into Vancouver, B.C., has more recently proposed an alternate plan. Under this scheme, the feeder would be used to supply more of the Northwest's leads. Concurrently, his company would build a takeoff from the Texas line in Oklahoma, running northeast to Detroit and on into eastern Canada.

On every job, we emphasize

Personal Supervision

The same personal supervision which enabled us to give complete satisfaction in the construction of 562 MILES OF PIPELINES last year is available for your current pipeline projects. And, in addition, please remember that when TROJAN handles your pipeline construction jobs, you get the full benefit of an organization of experienced personnel, ample equipment and financial stability.

TROJAN CONSTRUCTION CO.

INCORPORATED

Office: 2519½ S. Robinson • Box 4427, Oklahoma City 9, Oklahoma • Phone 2-7696 • Warehouse 1503 S.E. 29th, Phone 6-1430

MODERN EQUIPMENT • EFFICIENT PERSONNEL • FINANCIAL STABILITY

Two Companies Apply for Allocation of Panhandle Gas

Two companies, Missouri Central Natural Gas Co., Macon, and Southeastern Michigan Gas Co., Chicago, have asked FPC for construction permission and an allocation of Panhandle Eastern Pipe Line Co. gas to serve cities in Missouri and southeastern Michigan, respectively.

Missouri Central wants to build 60 miles of 6-in. line from a connection with the Panhandle system near Hannibal, Mo. to Macon. The company would serve Macon, Clarence, Shelbina, and Monroe City, Mo. The project would cost $1.2 million, and hinges on the direction of Panhandle to connect its system with the new Missouri Central facilities.

Southeastern Michigan, which had an earlier application denied without prejudice by FPC because it failed to show that it could render adequate service and that Panhandle could furnish necessary quantities of gas, filed an amended bid last month. Southeastern Michigan wants to bring Panhandle natural gas for the first time to Port Huron, Marysville, and St. Clair, Mich., and to contiguous areas in St. Clair and Macomb counties. It has asked FPC to order Panhandle to connect its facilities with a new 55-mile line that Southeastern Michigan would build.

FPC Sets Delivery Schedule For Mississippi River Fuel

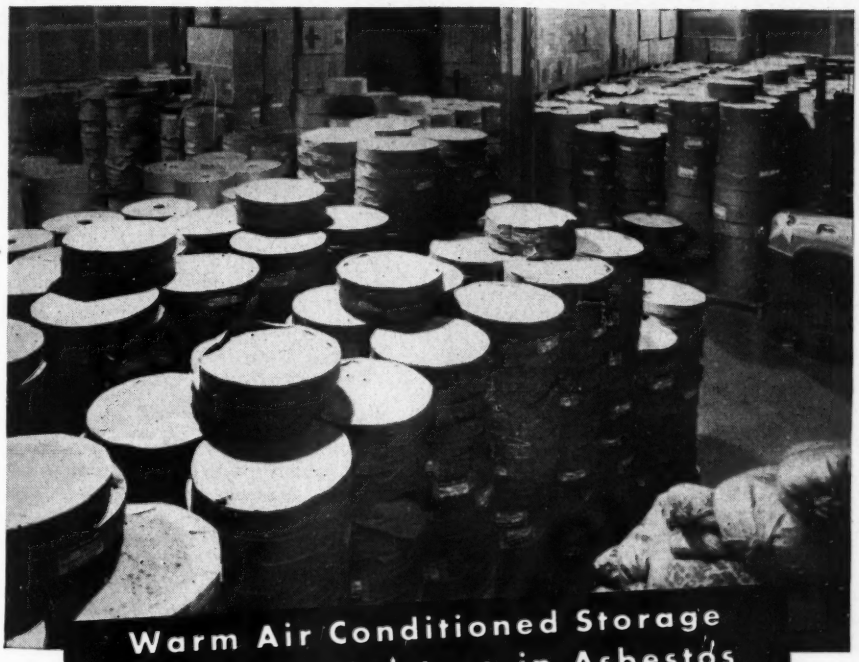
Emergency service rules allowing deliveries of natural gas to customers of Mississippi River Fuel Corp. were authorized by FPC last month. The rules will be in effect until February 1952, subject to prior termination by FPC.

Mississippi River Fuel requested the emergency service rules to comply with a condition contained in an earlier FPC authorization for the company to build four new compressor stations and to operate three more existing ones in order to increase its sales capacity.

The rules were worked out at a conference held in St. Louis, Oct. 26. Present were representatives of the Arkansas Public Service Commission, Illinois Commerce Commission, Missouri Public Service Commission, FPC staff, six utility customers, and 28 direct customers. All agreed on the proposed rules, which call for curtailment in two steps: (1) all the interruptible sales by Mississippi River Fuel under its interruptible rate schedules and all contracts are curtailed to zero; and (2) firm sales to Mississippi River Fuel's direct customers and to distributors are curtailed to certain specified volumes.

Pipeline Newsnotes

El Paso Natural Gas Co. will increase deliveries of natural gas to Phoenix, Ariz. by 67 MMcf daily (to a total of 143 MMcf daily) under terms of a temporary certificate granted the company by FPC last month. El Paso will spend slightly more than $1 million in constructing 31 miles of 16- and 10-in. line; 11.5 miles of 4½-in. line; 5.6 miles of 12¾-in. line; and six city gate metering and regulating stations.



Warm Air Conditioned Storage Eliminates Moisture in Asbestos Felt, Glass and Wrapping Materials at **standard pipeprotection inc.**

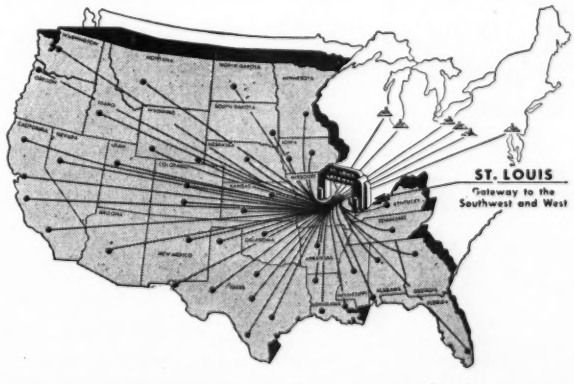
MOISTURE CONTROL—of wrapping materials before being incorporated into the hot coatings and applied to the pipe—is vital to quality production.

STANDARD'S ELABORATE . . . warming areas . . . 20,000 square feet . . . in addition to ideal material storage . . . provides for elimination of moisture on the pipe before cleaning . . . warm pipe for primer application . . . and especially warm pipe during coating and wrapping operations . . . all this plus electrical inspection at no additional cost.

STORAGE-IN-TRANSIT—Take delivery of your pipe . . . and store it up to 12 months without freight penalty in the largest storage area in the industry . . . through freight rates plus our storage facilities save you money.

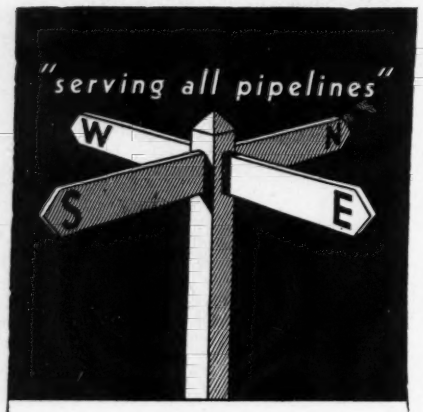
Write for Schedules

Existing railroad tariffs permit immediate shipment or stopover up to 12 months without freight penalty. When you ship your pipe through the St. Louis Gateway, you enjoy "through freight rates" instead of the higher combination rates generally used.



standard pipeprotection inc.

3000 South Brentwood Blvd. • St. Louis 17, Missouri



★

S. D. (STEVE) DAY

★

National Distributor for
THE RUBEROID COMPANY
• Pipe Line Asbestos Felt

★

Manufacturer's Representative for
PITTSBURGH COKE & CHEMICAL CO.
• Coal Tar Enamels

★

S. D. DAY COMPANY
2017 West Gray, Houston, Texas, Phone KE-0407

M-SCOPE PIPE-LOCATOR

TYPE 49 AB 1950 MODEL
- Metal Cased Cabinets
- One Man Operation

UNSURPASSED PERFORMANCE
- Fully Guaranteed
- Immediate Delivery

PRICE - - - - $149.50

—— FREE LITERATURE ——

FISHER RESEARCH LAB., INC.
Palo Alto California

New River Gas Co., a new company headquartered in Radford, Va., has asked FPC approval of a plan to build a 50-mile natural gas pipeline to serve Radford, Narrows, Pearisburg, Pulaski, and Dublin, all in southwestern Virginia. The line would cost $700,000, would carry gas to the communities from a connection with Atlantic Seaboard Corp. facilities in West Virginia.

Fluor Corp. is celebrating its 60th birthday in 1950. In commemoration of the attainment of this milestone, the Los Angeles firm has published a booklet, "60 Years of Progress," detailing Fluor's history, products, and services.

A top price of 10¼ cents at the wellhead is being paid by Arkansas-Louisiana Gas Co. for gas purchased under a new contract from Atlantic Refining Co., Greggton, Texas. Figured on a 14.65 psi pressure base, with increases after the first five years in half-cent increments until a 20th-year maximum of 13¼ cents is attained, the price is the highest reported in the East Texas-North Louisiana producing area.

Texas Eastern Transmission Corp., Big and Little Inch operator, reports a $1.5 million increase in earnings for the first three quarters of 1950 over the similar 1949 period. Per share net was up from $1.05 to $1.36, as deliveries through the company's vast network kept up a steady advance. In October, output averaged 725 MMcf per day, up from 666 per day for the previous nine months.

Elimination of the FPC requirement that the owner of the source of supply who proposes to export or import natural gas, or who enters into a contract for export or import, be necessarily a party in any application to FPC for authorization of such a contract, has been proposed by the commission.

Progress Reports

Planned

ALGONQUIN GAS TRANSMISSION CO., Boston, facilities to serve designated companies in Mass., R. I., Conn., and N. J. when adequate gas supplies are proved.

ARKANSAS-MISSOURI POWER CO., Blytheville, Ark. To build line from Big Inch to serve 12 towns in two states. To start within year.

ATLANTIC GULF GAS CO., 1500 miles, Alabama to Florida, Georgia, South Carolina.

CAROLINA NATURAL GAS CORP., Charlotte, N.C., 470 miles, 11 lines, from Transcontinental Gas Pipe Line Corp. main line to North and South Carolina communities.

CITIZENS GAS CO., Stroudsburg, Pa., **BANGOR (PA.) GAS CO., PEN ARGYL GAS CO.**, subsidiaries of Penn Fuel Gas Inc., laterals to receive gas from Manufacturers Light & Heat Co.

CITIES OF BOONEVILLE, RIPLEY, BALDWYN, Miss., to connect with Tennessee main line in Benton county, 16 miles of 6-in., 23 more miles, 11-mile tap.

CITY OF TRINIDAD, COLO., a 35-mile, 8⅝-in. line from Colorado Interstate's facilities to a distribution system to be built in Trinidad.

CONSUMERS GAS CO., Toronto, Can., 85 miles, Buffalo to Toronto.

EL PASO NATURAL GAS CO., to increase deliveries to Phoenix, Ariz., 31 miles 16- and 10-in.; 11.5 miles 4½-in.; 5.5 miles 12¾-in.; six metering and regulating stations.

GEORGIA NATURAL GAS CO., Albany, Ga., Phenix City, Ala., to Tallahassee with laterals and branches. $5.1 million.

JERSEY CENTRAL POWER & LIGHT CO., Asbury Park, 7 miles.

LAKE SHORE PIPELINE CO., ERIE GAS SERVICE CO. INC., and GRAND RIVER GAS TRANSMISSION CO., pipelines from a Meadville, Pa., connection with Tennessee Gas Transmission's line westward to Ohio.

MIDSOUTH GAS CO., Little Rock, 240 miles northerly from Helena, Ark.

MISSISSIPPI RIVER FUEL CORP., St. Louis, 22,000 hp in 8 authorized compressor stations and 5500 hp in a new one.

MISSOURI CENTRAL NATURAL GAS CO., Macon, Mo., 60 miles 6-in. from near Hannibal, Mo. to Macon. Measuring and regulating stations and extensions to distribution systems in cities to be served.

NEVADA NATURAL GAS PIPE LINE CO., 122 miles of 10¾-in. line from Topock, Ariz., to Las Vegas, Nev. Includes a 4-in. branch starting 4½ miles west of Boulder City and a 2½-in. branch from 2½ miles west of Needles into the city. To be finished early as possible in 1951.

NEW RIVER GAS CO., Radford, Va., 50-mile line from Atlantic Seaboard's system in W. Va. to a point near Radford with laterals to four towns.

NIAGARA MOHAWK POWER CORP., Syracuse, N. Y., 55-mile, 10¾-in. line to supply Watertown and other communities.

NORTHERN INDIANA FUEL & LIGHT CO., Auburn, Ind., 31-mile, 8⅝-in. line to carry gas to northeastern Indiana. Cost: $511,315.

NORTHWEST NATURAL GAS CO., for 700 miles in Washington, Idaho, Oregon.

OKLAHOMA NATURAL GAS CO., Tulsa, 40 miles of 16-in. from "Golden Trend" area to near Chickasha; 52 miles 26-in. from West Edmond field to new Depew storage project.

PACIFIC NORTHWEST PIPELINE CORP., 2175 miles of 26-in. from southern Texas to Seattle, Wash., Vancouver, B.C., via Oklahoma, Kansas, Colorado, Wyoming, Idaho, Oregon, Washington.

PANHANDLE EASTERN PIPE LINE CO., Kansas City, Mo., 185 miles of large diameter loop lines and 16,000 hp in compressor stations. Knupp Construction Co., Great Bend, Kan., is at work on an 85-mile, 4 to 12-in. gathering system in Hugoton field.

PEOPLES NATURAL GAS CO., Pittsburgh, 16 miles of 8- and 10-in., from Tennessee Gas spur in Big Beaver to borough of Midland, Beaver county, Pa. Start July, complete August.

PIEDMONT NATURAL GAS CO. INC., Spartanburg, S. C., six laterals totaling 74 miles from Transcontinental main line to North and South Carolina cities.

PUBLIC SERVICE CO. OF COLORADO, pipeline from the Piceance Creek field in western Colorado to Grand Junction and Rifle.

PUBLIC SERVICE CO. OF NORTH CAROLINA INC., Gastonia, 365 miles connecting at 10 points with Transcontinental main line in North and South Carolina.

SHENANDOAH GAS CO., Lynchburg, Va., for 49 miles from near Cedarville, Va., to cities in Virginia and West Virginia.

SOUTH CENTRAL ALABAMA NATURAL GAS CO. INC., 150-mile pipeline from a connection with Southern Natural's line in Elmore county.

SOUTH GEORGIA GAS CO., Atlanta, for 527 miles from northern Georgia into Florida to serve new markets in the two states.

SOUTH JERSEY GAS CO., Atlantic City, 77 miles, Camden to Atlantic City.

SOUTHEASTERN MICHIGAN GAS CO., Chicago, 55 miles of 12-in. from connection with Panhandle Eastern main line in Oakland county, Mich., to Marysville, Mich.

SOUTHERN CALIFORNIA GAS CO. and **SOUTHERN COUNTIES GAS CO.,** Los Angeles, on their 20- and 22-in. loop line from the Goleta dry gas field to L. A. SoCounties will complete its section in 1951 with a line from near Summerland to Goleta. SoCal will build a 21-mile loop from the Santa Clara river to the Simi tie-in.

SOUTHERN NATURAL GAS CO., Birmingham, 105 miles 10¾-in., Bolingbroke, Ga. to Aiken, S.C.; 19 miles 8⅝-in., 29 miles 12¾-in. Carthage, Texas, to Logansport, La.; 78 miles 14-in., Logansport to Perryville, La.; 40 miles 24-in. loops; 9000 hp in various compressor stations.

TEXAS EASTERN TRANSMISSION CORP., Shreveport, to boost capacity to 476 MMcf, 791 miles 30-in. from Kosciusko, Miss., to Connellsville, Pa.; seven compressor stations with 46,400 hp on new line, six with 52,500 hp on existing line; short lines in New York area.

TEXAS ILLINOIS NATURAL GAS PIPELINE CO., Chicago, to build 72 miles of line in Texas and change some compressor units to increase system capacity.

TRANSCONTINENTAL GAS PIPE LINE CORP., Houston, 11-mile mainline extension, 20- to 26-in. pipe, East Carteret, N.J., to Brooklyn. 17 miles 30- and 10¾-in. from Bergen county, N.J. to Paterson, N.J.

UNITED GAS PIPE LINE CO., Shreveport, 1005 miles in Texas, Louisiana, and Mississippi. Includes 451 miles 30-in., 6 miles 26-in., 53 miles 24-in. from Agua Dulce field in south Texas to Monroe, La.; about 245 miles of 30, 26, 24, and 20-in. from Gulf of Mexico northeast to Jackson, Miss.; 215 miles from this line to near Kosciusko, Miss.; 24 miles 8, 12, and 16-in. in south Louisiana; 16 miles of 16-in. from Koran gasoline plant site, La., to its Carthage-Sterlington line in Louisiana; 4000-hp compressor, dehydration plant.

VALLEY GAS PIPE LINE CO. INC., Houston, $144.5 million, 1000 miles of 30-in., from Hardin county, Texas, to southern Michigan, plus 500 miles of 24-in. in Texas and Louisiana, plus laterals, two 13,500-hp compressor stations, plus others aggregating 70,000 hp. Wants to start by Dec. 31, complete April 1, 1952.

WESTCOAST TRANSMISSION CO. INC., Wilmington, Del., 615 miles, including 277 miles from Sumas, Wash. to Portland, Ore. with short branches to a number of cities in the two states; 266 miles south from the Osoyoos, B.C. area to Spokane and Hanford, Wash.; and 72 miles of laterals and 13 measuring and regulating stations.

Approved

NEW YORK STATE NATURAL GAS CORP., New York, 164 miles of 16-in. from Dryden to Albany, N.Y.; 56-mile line from Dryden terminus to a storage pool in Tioga county, Pa.; facilities for a new storage pool.

NIAGARA MOHAWK POWER CORP., Syracuse, 7.4 miles 16-in. and 3 miles 12-in. from New York State Natural's Albany line to Niagara's Utica-New York system. 15.3 miles connecting New York State's system with Niagara's Albany county facilities.

NORTHEASTERN GAS TRANSMISSION CO., Boston, 400 miles of line from Tennessee Gas Transmission Co.'s system near Pittsfield, Mass. to Transcontinental's system near Greenwich, Conn. and metering and regulating facilities. To serve designated companies in Conn., Mass., and N.H.

TENNESSEE GAS TRANSMISSION CO., Houston, 303-mile extension from Erie county, N.Y. to N.Y.-Mass line; 787 miles of loop along existing or authorized line from Texas to Buffalo; 111,680 hp in existing, authorized, or new compressor stations; 75 miles of laterals.

TEXAS EASTERN TRANSMISSION CORP., Shreveport, 35 miles of 30-in. from Fayette county, Pa. to Westmoreland county, Pa.

UNITED FUEL GAS CO., Charleston, W. Va., 5.5 miles, 6450-hp compressor stations to deliver gas to storage pools in West Virginia.

Under Way

AMERE GAS UTILITIES CO., Charleston, and **BLUEFIELD (W.VA.) GAS CO.,** for service to Bluefield, Va., and Bluefield, W. Va. Amere, a measuring and regulating station. Bluefield Gas, 14.3 miles of 6⅝-in. and regulating station.

CENTRAL KENTUCKY NATURAL GAS CO. has Williams-Austin Co., Pittsburgh, at work on 42 miles of 20-in. from North Means compressor station to Foster, Ky.

EQUITABLE GAS CO., Pittsburgh, 17 miles of 8- to 16-in., 3520-hp booster, dehydration plant, near Waynesburg, Pa.

EL PASO NATURAL GAS CO., line from San Juan basin, New Mexico, to Topock, Ariz. Work began in Sept. near Farmington, N.M., on the 433-mile, 24-in. line. To be completed Jan. 1.

HUMBLE OIL & REFINING CO., Fort Worth, 50 miles 8-in. from Trawick gas pool in Nacogdoches county to Longview. Crews are surveying and acquiring right-of-way. To be completed Dec. 15. Trojan Construction Co.

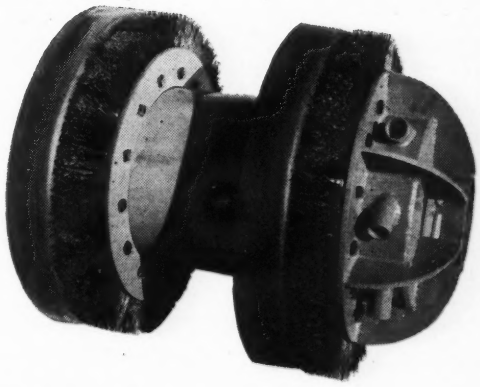
MANUFACTURERS LIGHT & HEAT CO., CUMBERLAND & ALLEGHENY GAS CO., NATURAL GAS CO. OF W. VA., and HOME GAS CO. Manufacturers: 44 miles 4- and 16-in. in Ohio, Pa., and W. Va., and two 500-hp units. Cumberland: 10.3 miles 6- and 8-in. and a 65-hp station in W. Va. Natural Gas Co.: 4.5 miles of 4-, 6-, and 8-in. in Ohio. Home: meter and regulating station in Rockland county, N. Y.

MICHIGAN GAS STORAGE CO., Jackson, 83 miles 22-in. Ovid, Mich., to Muskegon river, started Aug. 1, to be completed Dec. 1 by

Williamson Gas Line Pigs* Traverse 1½R 90° Bends

← 24" Size New Design TYPE GP PIGS with Brushes Mounted on Arched Springs to Compensate for Wear

30" Size → Standard Design TYPE RCN-50 with Jet Rotation Feature to Distribute Wear



*Patents Pending

Above Designs Available in 16" and Larger. Other Designs as Small as 2".

THE PIG WITH THE POKE CLEANS PIPE LINES

T. D. Williamson, Inc.

TULSA 9, OKLAHOMA

INDEX TO ADVERTISERS

American Meter Co. 8, 9
American Radiator & Standard Sanitary Corp. —
American Recording Chart Co. —
Anchor Petroleum Co. —

Barrett Division, The 86
Blaw-Knox Co. —
Bowser Inc., Incinerator Division —
Bryant Heater Division —

Caloric Stove Corp. 46
Carbide & Carbon Chemicals Division, Union Carbide & Carbon Corp. —
Cast Iron Pipe Research Association 6, 7
Chaplin-Fulton Manufacturing Co. 24
Cleveland Trencher Co., The —
Combustion Engineering-Superheater, Inc. —
Connelly, Inc. 68
Consolidated Engineering Corp. —
Cooper-Bessemer Corp., The 76, 77
Crane Co. 14
Cribben & Sexton Co. —
Crose Manufacturing Co., M. J. —

Day Co., S. D. 92
Detectron Co., The —
Detroit Brass & Malleable Works 22
Detroit Michigan Stove Co. —
Detroit Gas Regulator Co. 64
Dowell, Inc. —
Dresser Industries, Inc. 11, 58, Third Cover
Dresser Manufacturing Division 11, Third Cover

Empire Stove Co. 43
Evans Sales Co., G. S. 62

Fisher Governor Co. 20
Fisher Research Laboratory, Inc. 92
Fluor Corp., Ltd. 74

Gama Industries, Inc. —
Gas Appliance Manufacturers Association —
Gas Machinery Co., The —
General Controls Co. —
General Gas Light Co. —
Greene, Gordon Z. 3
Greenlee Tool Co. 66

Hardwick Stove Co. —
Hays Manufacturing Co. 61
Heatbath Appliances, Inc. —
Heath Tree Service, Inc. —
Hydrauger Corp., Ltd. 64

Johns-Manville Corp. —

Kaiser Steel Corp. 85
Kitson Division, The Welsbach Corp. 70
Koppers Co., Inc. 10

Lancaster Meter Parts Co. 60
Longhorn Industries 59

McCabe Powers Auto Body Co. —
Mettler Co., The —
Middle West Coating & Supply Co. —
Minneapolis-Honeywell Regulator Co. 45
Milwaukee Gas Specialty Co. 49
Mueller Co. —

National Tube Co. —
Natural Gas Odorizing Co. —
Nordstrom Valve Division Rockwell Manufacturing Co. 4, 5
Norton-McMurray Manufacturing Co. 57
Norwalk Valve Co. 68

Oronite Chemical Co. —

Peerless Manufacturing Co. —
Peerless Manufacturing Corp. 69
Phillips Petroleum Co. 1
Price Co., H. C. —

Rector Well Equipment Co. 63
Reliance Regulator Division Second Cover
Reynolds Gas Regulator Co. 41
Robertshaw-Fulton Controls Co. —
Rockwell Manufacturing Co. Front Cover, 17, 18
Roots-Connersville Blower Corp. 58
Roper Corp., Geo. D. 53

Safety Gas Main Stopper Co. —
Security Manufacturing Co. —
Selas Corp. of America —
Sharples Chemicals Inc. —
Skinner Co., M. B. 50, 51
Smith Corp., A. O. 67
Sprague Meter Co. Fourth Cover
Stacey Manufacturing Co., The 69
Standard Pipeprotection, Inc. 91
Stauffer Manufacturing Co. 68
Stewart-Warner Corp. —
Surface Combustion Corp. 16
Superior Meter Co., Inc. —

Thermac Co. —
Thomas & Associates, Inc., H. Emerson 72
Titan Valve & Manufacturing Co. 12
Toledo Pipe Threading Machine Co. —
Trojan Construction Co. 90
Tulsa Pipe Coating Co. —

U. S. Pipe & Foundry Co. 13
Union Carbide & Carbon Corp., Carbide & Carbon Chemicals Division —
United Engineers & Constructors, Inc. 81
United Petroleum Gas Co. 72
United States Steel —
Utility Control Co. 65

Vulcan Rubber Products, Inc. —

Wachs Co., The E. H. —
Walworth Co. —
Ward Heater Co. —
Warren Petroleum Corp. —
Webster Engineering Co. —
Welsbach Corp., The 70
White Products Corp. 71
White-Rodgers Electric Co. 55
Williamson, Inc., T. D. 93
Worthington Pump & Machinery Corp. —

Mahoney Contracting Co. The company's construction crew is installing two 2200-hp compressor units at an existing station in Michi[illegible] and moving in four 800-hp units from its Ch[illegible] pewa station.

NEW YORK STATE NATURAL [illegible] build 44½ miles of 16- and 18-[illegible] the Leidy gas field with its system in [illegible]

PACIFIC GAS & ELECTRIC CO., Bechtel-Price-Conyes now comple[illegible] 34-in., Topock, Ariz., to Milpitas, Calif.

SOUTHERN NATURAL GAS CO., Birm[illegible] Ala., to start soon on 105 miles of [illegible] Georgia, South Carolina, Alabama, [illegible] sippi; has Sheehan Pipeline Const[illegible] working on 180 miles of 18-in. f[illegible] Miss., to Selma, Ala. Two spreads [illegible] plete. Sheehan also building 32 mi[illegible] Wetumpka, Ala., started Oct. 2[illegible] crews have completed 2 crossings, just [illegible] and are 80% finished with one. Ford, B[illegible] Davis to build two Mississippi [illegible] and 11,000 hp in existing stations. Associated Pipe Line Contractors is stringing 161 miles 16- and 18-in. in Alabama.

SOUTHERN UNION GAS CO., Dallas, for 15 miles of 10-in. and 12-in. from Kutz canyon to Blanco gas field, N. Mex. To be completed this month.

SOUTHWEST GAS CORP., Barstow, Calif., is building a 2-mile line to Barstow from the PG&E main line; 4 miles, Barstow to U. S. Marine Corps base at Nevo; 27 miles to George air base and 5 miles from there to Victorville. All 4½-in. pipe. To be completed Jan. 1.

TENNESSEE GAS TRANSMISSION CO., Houston, has Latex Construction Co. working on 99 miles of 30-in., 68 miles from West Monroe to Natchitoches, La., completed. Remaining 32 miles from Eudora, Ark., underway; 95 miles of 20-in. from Natchitoches to Kinder, one spread finished; 102 miles of 16-in. and 11 miles of 12-in. from Kinder to Bayou Sale, La., underway. Latex working on two 16-in. submarine lines below Greenville bridge, started last winter, work resumed recently. Latex also working on 15 miles 12-in. from north of Delcambre, La. to vicinity of Tigre Lagoon. Started Oct. 10. Houston Contracting Co. recently started two 16-in. Mississippi river crossings near Greenville.

TEXAS-ILLINOIS NATURAL GAS PIPELINE CO., Chicago, on its 1331-mile line, to Midwestern Constructors Inc., 100 miles of 30-in. from Mississippi river to Farina, Ill. H. C. Price Co. is under way on 110 miles of 30-in. from Hungerford, Texas to Urbana, Texas, 36 miles of 24-in. from Hungerford to Old Ocean field and 38 miles of 12-in. from Chocolate Bayou field to junction with 24-in. line approximately 10 miles north of Old Ocean field. Bechtel Corp. under way on 75 miles of 30-in. from Newport, Ark. to Moark, Ark. Parkhill Truck Co. stringing for Bechtel and Midwestern. Dunn Bros. Trucking Co. for H. C. Price Co. Fish Constructors Inc., Houston, is building compressor stations.

TRUNKLINE GAS SUPPLY CO., Houston, has Houston Contracting Co. working on 176 miles of 26-in. from Longville to Darnell, La., and 51 miles of gathering lines out of Longville, La. Total completion: Dec. 20. Anderson Bros. Corp. at work on 180 miles, 26-in., Darnell to Senatobia, Miss., and 217 miles 24-in. Longville to Garwood, Texas. Parkhill Truck Co. stringing above jobs. On 740-mile, Louisiana-to-Illinois line, R. H. Fulton, Lubbock, Texas, is working on 278 miles of 12- and 20-in. and 184 miles of 26-in. Mahoney Contracting Co. under way on 186 miles of 26-in. Four major river crossings to be made under Mississippi, Ohio, Washita, and Red rivers. Anderson Bros. have contract for the first, J. Ray McDermott & Co. for the other three. Project will include six other river crossings for which contracts are not let.

UNION GAS CO. OF CANADA LTD. Shaw Construction Co., Sarnia, Ont., building a 16-in. line extending 61 miles from Windsor, Ont., to Dawn township.

UNITED GAS PIPE LINE CO., Shreveport, 16 miles of line, a compressor station and a dehydration plant in Webster, Bossier, and Ouachita parishes, La.

GAS

Expert Views On Changeover Problems 25

Texas Gas Reaches Gotham 73

ENGINEERING • UTILIZATION • PIPELINES • MANAGEMENT

ROCKWELL-EMCO EJECTOR SERVICE REGULATORS

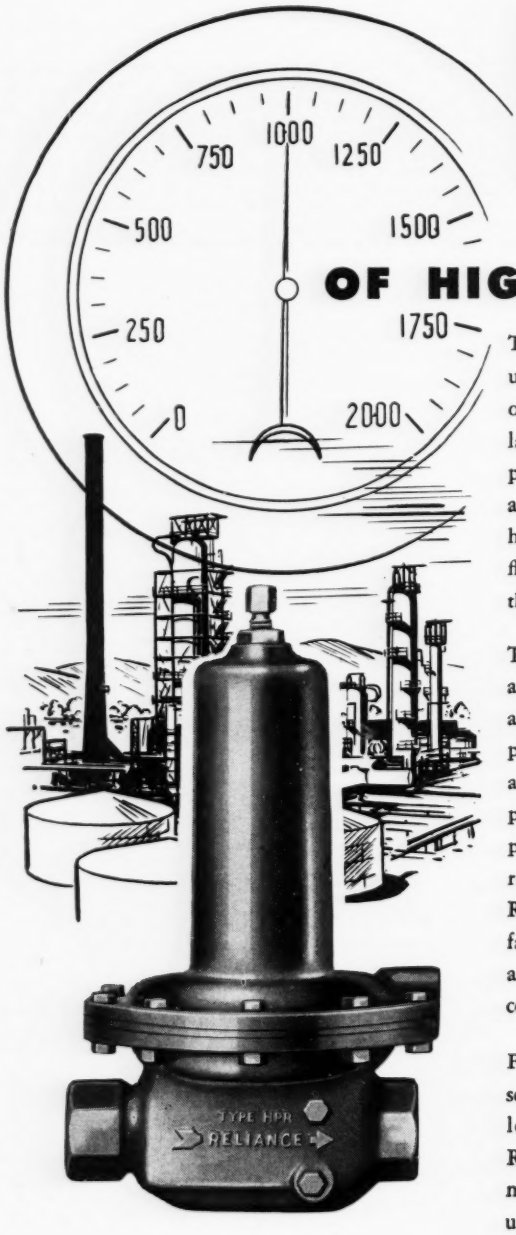
Cushion THE IMPACT OF PEAK LOADS

A SIMPLE LITTLE EJECTOR RING BOOSTS PRESSURE AS DEMANDS INCREASE

ROCKWELL

Silent Masters

OF HIGH PRESSURE GAS

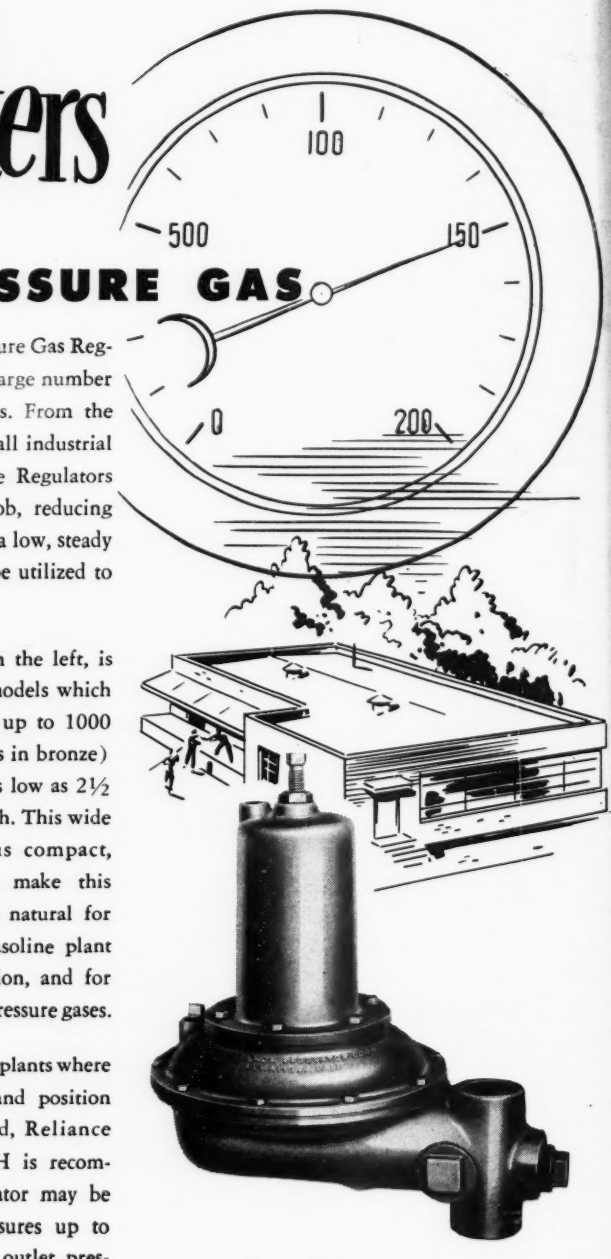


Type HPR

These two High-Pressure Gas Regulators are used by a large number of different industries. From the largest refinery to small industrial plants, these Reliance Regulators are always on the job, reducing high gas pressures to a low, steady flow of gas that can be utilized to the best advantage.

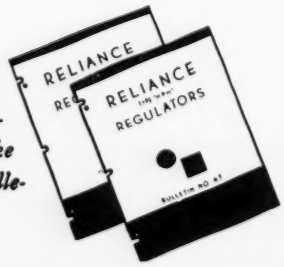
Type HPR, shown on the left, is available in several models which allow inlet pressures up to 1000 pounds (2000 pounds in bronze) and reduce them to as low as 2½ pounds per square inch. This wide pressure range, plus compact, rugged construction, make this Reliance Regulator a natural for farm taps, general gasoline plant and refinery installation, and for controlling any high pressure gases.

For smaller industrial plants where sensitive regulation and position lock up are required, Reliance Regulator, Type HPH is recommended. This Regulator may be used with inlet pressures up to 150 pounds and the outlet pressures may be reduced to as low as ½ pound per square inch.



Type HPH

For more information on High-Pressure Regulators like these, write for Bulletins 47A and 48A.



AMERICAN METERS

AMERICAN METER COMPANY
INCORPORATED

1000 MERIDIAN AVENUE, ALHAMBRA, CALIFORNIA